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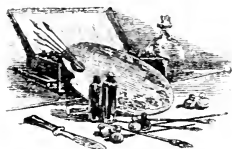
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William F. Edwards



TRADES DESCRIBED.

A BOOK FOR THE YOUNG.



LONDON:

THE RELIGIOUS TRACT SOCIETY;

56 PATERNOSTER ROW, AND 65 ST. PAUL'S CHURCHYARD;

AND SOLD BY THE BOOKSELLERS.

CONTENTS.

	Page
THE GARDENER	1
THE BUILDER	11
THE ARCHITECT	13
THE STONE-MASON	13
THE BRICKMAKER	18
THE BRICKLAYER AND PLASTERER	24
THE CARPENTER AND JOINER	29
THE PLUMBER, PAINTER, AND GLAZIER	38
THE SHOEMAKER	55
THE TAILOR	66
THE CABINET-MAKER AND UPHOLSTERER	77
THE HATTER	91
THE PAPER-MAKER	106
THE PRINTER	121
THE TYPE-FOUNDER	129
THE BOOK-BINDER	136
THE BLACKSMITH	143
THE ROPE-MAKER	150
THE TALLOW-CHANDLER	156
THE BASKET-MAKER	164
THE WATCH-MAKER	169
CONCLUSION.	174

TRADES DESCRIBED.



THE GARDENER.

GARDENING is a very ancient occupation, for the first man that ever lived was a gardener. We are told in the Bible, that "the Lord God planted a garden in Eden; and there he put the man whom He had formed;" and that he put him into it "to dress it and to keep it," Gen. ii. 8—15. No doubt this was very pleasant labour. But after the fall, the ground was cursed, and man was sentenced to painful and constant toil.

When men are in a rude and uncivilized state,

they do not care much about gardens ; and very rarely cultivate the ground, to any great extent, even to procure fruits and vegetables for daily consumption ; they depend more upon hunting and fishing for their subsistence, and therefore take much greater pains in making implements for the chase and for war, than for tilling the ground. The only tool for this purpose in use among some savage nations, is a pointed stick—a very poor substitute for a spade. Just fancy how surprised some of our clever gardeners would be, if such a thing were put into their hands to dig with ! They would make but a poor day's work with it.

One great reason, probably, why the cultivation of ground is not much attended to in savage countries, is, that property is very insecure, and there are no laws to prevent people from robbing one another. And then they have no clear views of what is right and wrong, and care but little about either. So we may suppose that if one of them were to get a taste for gardening, and raise a little fine fruit or a few scarce vegetables, his neighbours would very soon come in and take them away, whether he liked it or not. Such things do happen even in England sometimes.

But when people begin to be civilized, and to have good laws, so as to get and to keep a few comforts about them, they acquire a love for the cultivation of the ground ; and so, by degrees, gardening becomes a regular trade among them, as it is in our country. How thankful we ought to be that our ancestors went through all the rough work, and left us only the smooth !

The first gardens in our country only contained the commonest fruit, and perhaps a few vegetables ; but as wealth and commerce increased, new varie-

ties of both were introduced, from time to time; the native products were improved, and gardening became at length, as it is now, a profitable trade.

A gardener's occupation is carried on in three principal departments—the flower, fruit, and kitchen garden. A good gardener will endeavour to obtain a practical knowledge of each of these departments.

In order that a man may be a scientific gardener, he must possess a good knowledge of botany and chemistry, and must understand something of many other sciences; and it is very desirable that every gardener should be, as far as possible, a scientific gardener. But still there are many good practical gardeners, who have very little of science.

The flower gardener, or florist, as he is called, requires a great deal of taste in the arrangement of his borders and beds, and management in keeping up a good succession of blossoms. When this is well attended to, the flower garden will present a gay appearance for nine months in the year, and that without any very great variety of flowers.

Some people are very fond of rare and tender flowers; and where they can afford time and expense it is all very well; but after all, some of the commonest are quite as rich and beautiful as the rarest; and even a field daisy, a hedge-row violet, or a simple primrose, cannot be rightly examined without exciting our admiration of the skill that contrived them, and the goodness that permits them to grow in our sinful world.

The flower-gardener should not suffer a weed to grow in his garden; as soon as he perceives it springing, he should pull it up by the roots. It requires a great deal of patience to keep the beds clean and tidy; for there is an old saying, and a

true one too, that "ill weeds grow apace." And so it is with your hearts, my young friends. Bad tempers and evil dispositions are constantly springing up, and they will require all your strength, and more than your own strength, to get rid of them. This can never be done effectually but by the grace of God, and you know that He has promised his Holy Spirit to those that ask him.

If we were to see a flower-bed overrun with weeds, we should take no pleasure in looking at it, but turn to something more attractive. And when men, women, or children are constantly mischievous, bad tempered, fretful, or in any way disagreeable, every body about them is sure to turn away in disgust, and forget what few good qualities they may have. And more than this, God is angry with them too. Think of this, young reader, and pray for the grace of God ; and strive as well as pray, that you may get rid of your bad dispositions.

Some young people are very fond of a flower-garden, and when they can get a little piece of ground, ay, or only a few flower-pots, will spend a great deal of time and take much pains in cultivating their favourite plants. It would be well if this kind of amusement were more resorted to ; for the habits of care, good order, and patience which it helps to produce, will be of great use in after life, to say nothing of the present pleasure that they afford. Some young people feel great delight in making up an early nosegay out of their own little gardens, to present to their parents or friends, perhaps on the anniversary of a birth-day, or wedding-day ; this is very pleasant, and must give great gratification to all concerned.

Perhaps the writer will be expected here to put down the names of different sorts of flowers, and

the way of cultivating them, the time of planting and flowering, the sort of soil suitable for them, and many other particulars. But this would take up a great deal of room in this little book, and would indeed require a book of itself instead of a few pages. The better way will be to recommend any young people who wish for a flower-garden, and can get a little piece of ground for this purpose, to ask the advice of their friends—(perhaps they can make friends with some gardener)—as to what flowers it would be best for them to plant or sow, and the best time for doing it. This, with a little experience and observation, will be more useful than anything that could be written about it. They must not forget, however, to dig the ground nicely before putting anything into it, and to keep it always free from weeds, and well watered. A few garden tools will be necessary; perhaps they can borrow them, or they may like to have some of their own. If so, a small spade, a rake, a hoe, and a watering-pot, will cost a few shillings, but it will be money well spent; that is, if they are well used.

Now a little must be said about the fruit-garden. Perhaps you can tell the names of the different kinds of fruit that grow in an English garden, such as currants and gooseberries, strawberries and raspberries, cherries and plums, apples and pears, and so on. But it may be that you do not know that all these fruits owe much of their rich flavour to cultivation and training. Cultivation and training are great things in other matters of more importance than fruit-trees. Look to yourselves, young folks!

One of the gardener's most important operations is pruning, that is, cutting away unnecessary branches and shoots; and for this purpose he uses

a strong, sharp, hooked knife, with a handle larger at the end farthest from the blade. It is made in this form in order that he may take a firm hold of it in his hand when using it. It requires much experience to be able to prune trees well, for there is a danger of taking away some part of the tree that ought to be left, or of leaving something that would be better away. And different kinds of trees should be differently pruned.

Then another very delicate piece of work is grafting. This is done by taking a scion, or shoot of one tree, and putting it into the stock or body of another tree, so as to grow into it, and become a part of it.

Perhaps you will remember that pruning and grafting are both spoken of in the Bible. When Jesus told his disciples that he was the true vine, and his Father the husbandman, he said, "Every branch in me that beareth not fruit he taketh away: and every branch that beareth fruit, he purgeth it, (or pruneth it,) that it may bring forth more fruit," John xv. 2. We should learn from this, not to think harshly of good people, because God sees fit to afflict them, nor to suppose, because they have so many trials, they must be hypocrites, and that God is punishing them for their hypocrisy; for we read that, "whom the Lord loveth he chasteneth, and scourgeth every son whom he receiveth," Heb. xii. 6.

Besides pruning and grafting, the gardener will have to dig about the roots of the trees, and to see that the blossoms and tender leaves are free from vermin; and he will be careful, too, to get good varieties of fruit, and to keep up a succession of young and healthy trees; and yet with all these precautions his crops will sometimes fail.

And now we are come to the kitchen-garden. The vegetables more commonly cultivated are potatoes, cabbages of various kinds, including cauliflowers and brocoli; carrots, turnips, parsnips, radishes, onions, celery, rhubarb, lettuce, peas and beans of different sorts, and herbs.

The great care of the gardener here should be, as with fruit, to procure good sorts of the different vegetables, and to have, as far as possible, a constant succession either for the table or the market. A little experience will soon teach him this necessary part of his business.

Some young folks, in addition to a little flower-garden, are allowed to cultivate a piece of ground as a kitchen-garden; and they well know by experience how nice the new potatoes, and early peas, and broad beans, cultivated by their own hands on their own ground, are, and how happy it makes them to be able to present a favorite dish of vegetables, out of their own garden, at the family dinner table. This is a pleasure far greater than any selfish gratification can produce; and it is recommended to all the young people who read this book to try to do this, should it be in their power.

We are so used to vegetable food now, and almost all sorts of vegetables can be procured so cheaply, that we wonder how our forefathers could manage without them. Yet, till within the last three hundred years they were but very scantily used as articles of food. Potatoes, especially, were unknown in this country until the year 1584, when it is supposed they were introduced by Sir Walter Raleigh, who brought them from America. The cabbage is a native of England. In its wild state it grows among the rocks on the sea-shore, and was used as a medicine long before

it was cultivated for food. Peas were considered great dainties in the time of Queen Elizabeth, when they were brought from Holland, and could only be procured at a great cost.

Besides the flower, fruit, and kitchen-gardens, it need hardly be mentioned that there are green-houses, for sheltering tender flowers and plants; and hot-houses, for fruits that would not bear the cold of our climate, or for producing finer and earlier fruit than could be grown in the open air. In this way, grapes, melons, peaches, cherries, and pine-apples are brought to great perfection; and oranges and lemons are grown, though more for their beauty and curiosity, than for real use.

The green-house and hot-house require constant care and attention; for a little oversight or neglect on the part of the gardener might destroy the whole crop of fruit for the season, or blight all the flowers or plants under his care. And as these houses are very expensive to build and keep in good order, only rich people can have anything to do with them.

Cucumbers and gourds are to be found in most gardens of any size. They are grown on hot-beds, and generally are covered with a wooden frame with a glazed top, which may be opened or shut as the gardener thinks proper. They can, however, be grown without any such shelter.

In the neighbourhood of London, and other large towns, there are a great many persons who get their living as market gardeners—that is, they grow all kinds of vegetables and fruits and flowers, and send them to the markets for sale. Have any of the young readers, who live in London, ever been to Covent Garden Market? If not, go, by all means, as soon as you can obtain permission.

The best time to see it is very early in the morning, as soon as it is light; for then the market gardeners are coming in and unloading their carts and wagons. It seems astonishing how such a quantity of fruit and vegetables can be disposed of:—but before night it is almost all gone, and the green-grocers are ready for a fresh supply the next morning.

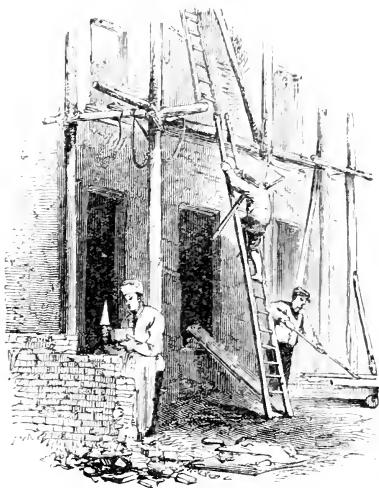
There are a great many men who make a trade of gardening. Some of them have gardens of their own—these have just been mentioned. There are others who work for these master-gardeners—they are called labourers. There are some, again, who live as gardeners in gentlemen's families, and sometimes have a neat little cottage near the garden to live in. They are generally very respectable men, and are highly esteemed by their employers. And then, there are others, who get a good living by working by the day for people who have gardens of their own, but do not keep a regular gardener. These are called jobbing gardeners. They get very well paid for their work; but it is necessary for them to be frugal and saving if they would get on; for there are a great many days in the year when there is not much to do; and they sometimes go whole weeks in the winter without being able to do any regular work. This is the case, too, with the market gardeners' men: so that they ought to mind the old proverb, and "lay up for a rainy day."

There is no employment in which industry, care, perseverance, and patience, are more necessary than in that of a gardener; but if a man possess a good share of these excellent qualities, there is no employment that can be thought of, as more agreeable and honourable.

Something has been said about one garden which

we read of in the Bible—the Garden of Eden ; perhaps, young friends, you will remember another—the Garden of Gethsemane. Jesus was fond of this garden, and “ofttimes resorted thither with his disciples,” John xviii. 2. And when he was just about to be betrayed by the wicked disciple Judas, he went into this garden. And while he was there, he became very sorrowful, and prayed to his heavenly Father for support in the hour of trial that was coming on. And it was in this garden that he was delivered to the wicked men by whom he was afterwards crucified. Let us then, sometimes, when we are in a garden, think of his great love in suffering for us, and pray for his Holy Spirit to help us to live to him.

There is another garden yet, mentioned in the history of the Lord Jesus, I mean the garden in which he was buried. For “in the place where he was crucified there was a garden ; and in the garden a new sepulchre, wherein was never man yet laid. There laid they Jesus,” John xix. 41. Oh, what an honour was thus laid upon this garden and its owner ! But the precious deposit was not long there ; for when, on the third day, the disciples of the great Redeemer came to the garden and the sepulchre to weep over their Master, they found that he was already risen from the dead, to die no more. Do you know why Jesus died and rose again ? We are told that “He was delivered for our offences, and was raised again for our justification,” Rom. iv. 25 ; and this is all the ground of hope that any poor sinner can have of being saved from the wrath of God. Think of this when you walk in a garden, and seek to have an interest in His death and resurrection.



THE BUILDER.

ONE of the most necessary things for man is a house to live in; and the art of building is very ancient. The first habitations that were built, were, no doubt, of very rude construction, as we find to be the case now in uncivilized countries. Huts constructed with branches of trees, and plastered with mud, were probably the first specimens of architecture, as these are the materials still in use in the countries referred to. By degrees, however, other materials were thought of—stones were

cemented together with moistened clay ; then bricks were made of clay, and hardened in the sun—and, as civilization advanced, greater pains were taken in the structure, form, and decoration of houses, until the art of building arrived at that degree of perfection in which we see it in our own country.

The first builder that we read of in the Bible was Cain—the wretched murderer, Cain—who when he went out from the presence of the Lord, dwelt in the land of Nod, and “builted a city, and called the city, after the name of his son, Enoch,” Gen. iv. 17. Miserable man that he was, perhaps he sought, in the occupation thus afforded him, to escape from the torment of a guilty conscience.

The houses of the ancient Britons are spoken of in history as “wretched cottages constructed of wood, and covered over with straw,” without chimneys or windows ; and the probability is, that every man, in those days, was his own builder. But after a time, and by degrees, as commerce and civilization advanced, the construction of houses became a distinct trade ; and, at length, branched out into several and various departments, as it is in the present day.

For instance, we have the architect, whose business it is to draw plans of all kinds of buildings, and superintend their erection. Then there are the stone-mason, bricklayer and plasterer,—the carpenter and joiner—the plumber, painter, and glazier. We will take each of these in its turn.

THE ARCHITECT.

And first, the Architect.

But it must not be forgotten that this is a book about trades. Now architecture is not exactly a trade ; but is what is termed a profession. Drawing is one very necessary acquirement of an architect. There are a great many ways in which skill in drawing may be very desirable ; and, if it be only for the pleasure it affords, it well deserves the attention of the young. Architectural drawing is a distinct branch of the art, and requires patience and perseverance to learn.

THE STONE-MASON

We come now to the Stone-mason.

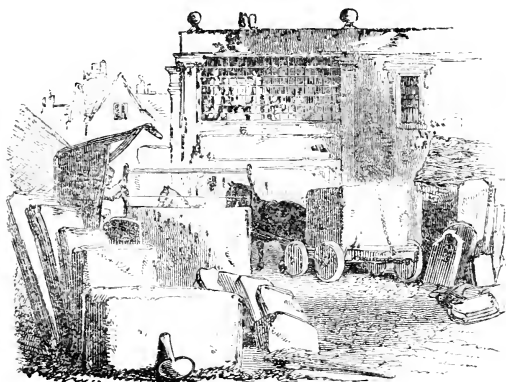
The young reader has probably often passed by a stone-mason's yard, and has noticed some men sawing the large blocks of stone with their heavy saws, and others cutting it with chisels and large wooden hammers.

The stone that is commonly used in building, particularly in London, is brought from Portland, an island on the Dorsetshire coast, in which there are extensive quarries. It is a very durable material, and though soft when cut out of the quarry, it afterwards becomes harder. It is brought from the island in very large blocks some of them weighing a great many tons ; and these blocks are cut, by the mason, into the size and form required for any particular purpose. Many of the large buildings in London are constructed

of the Portland stone. St. Paul's Cathedral is one of them.

Another kind of stone is found in Gloucestershire, and is extensively used for building, being cheaper than the Portland stone, but much softer, and not so durable.

Granite, which is a harder sort of stone, is also much used, especially where great strength and durability are required. This is brought from Cornwall and Scotland. If you should have occasion to pass over London Bridge, you will see a fine specimen, in the bridge itself, of Scotch granite; and if you will take the further trouble of comparing this stone with that of which St. Paul's Cathedral is built, you will easily discover the difference between granite and freestone.



Now let us take a peep into the mason's yard, and see what is going on there. The first thing we notice is a large irregular mass of stone, which a

workman is sawing into shape. The man, we see, is sitting under a kind of shed to shelter him from the weather, and by his looks seems to say, "hard work-master." Well, it does not seem very easy work; the saw that he is using appears to be a remarkably heavy and unwieldy tool—let us examine it. Oh, how odd! it has no teeth! Very true; it is merely a large, long, and straight iron blade fixed into two upright pieces of wood, which are again connected at the top by a beam, which, of course, is parallel with the blade at the bottom. The man, we see, sits at one end of this saw, moving it backwards and forwards across the stone, which it cuts into by its own weight and the friction caused by the continual motion. Considerable skill is required in keeping the saw perfectly perpendicular, or upright, so that the stone may be cut square and even. A little inattention in this particular might undo the work of many days, and spoil the stone also. The large blocks of stone, being cut into the shape required, are finished off with the chisel and mallet, according to the sort of work for which they are intended.

Besides the square blocks which are used in the foundations, or plain walls of houses, and other buildings of stone, there are a variety of other forms in which it is required to be cut, either for use or ornament. These different parts of a building are generally cut with chisels and mallets, excepting the plain surfaces, which are produced by saws of different sorts and dimensions, according to the size or sort of stone to be cut. After being thus worked into shape by the chisel, they are rubbed to a smooth face by the hand, with sand or grits.

The tools in general use by stone-masons, are

(besides the saw, mallet, and chisel already mentioned), the square level, plumb-line, bevel, compass, hammer, and trowel. They have also machines for raising and moving heavy weights, such as the lever, pulley, wheel, and crane.

Besides the outer walls of buildings, the stone-mason is sometimes employed in the construction of staircases, the flooring of halls, and other rooms, etc. Portland stone is principally employed for this work; it being the handsomest freestone known, and capable of very delicate workmanship.

Another part of the stone-mason's business, is that of cutting tombstones and monuments for the dead. The lettering is cut out with chisels, and afterwards painted. It will be of little importance to us, young friends, in what fashion our names may be recorded on stone or marble, or whether they be recorded at all; let our concern be to have our names written in "the Lamb's book of life."

"In thy dear book of life and grace,
Oh may I find my name
Recorded in some humble place,
Beneath my Lord, the Lamb."

This record will outlast all the stone and marble monuments in the world.

The most famous stone building of which we read in the Bible was the Temple at Jerusalem, built by king Solomon. A particular account of this temple is recorded in the first book of Kings, and the second book of the Chronicles; you can find and refer to it. It appears to have been one of the most magnificent structures ever raised. The expense of building it was very great indeed, having been calculated to amount to the value of hundreds of millions of pounds of our English

money. More than 180,000 men were employed in building it, and it took seven years and a half to finish it. The walls were built of hewn stone, and care was taken that they should all be prepared before being brought to their destined place, "so that there was neither hammer, nor axe, nor any tool of iron heard in the house, while it was in building," 1 Kings vi. 7. Young friend, you know that this temple was an emblem or type of that living temple of which Jesus Christ is said to be the chief corner stone—or the foundation stone. Let the peculiarity just mentioned, remind you that the stones in the living temple, which will be perfected in heaven, must all be fitted and made ready in the present state of preparation. There no further fitting and preparing are needed. It is only those who have been made ready here, can be admitted as a part of the temple above.

When the blessed Saviour is alluded to, in the Scripture, as a foundation stone, or a chief corner stone, it is, of course, a figurative expression, and is intended to convey an idea of his value and ability. A building may be very fine, and its materials may be very expensive; but unless it be built on a good and sufficient foundation, it will soon fall by its own weight. Jesus Christ is the only foundation on which the church of God can be built. His atoning sacrifice is the only foundation on which a guilty sinner can build his hopes of salvation from the wrath to come. "Wherefore also it is contained in the Scripture, Behold, I lay in Sion a chief corner stone. elect, precious: and he that believeth on him shall not be confounded," 1 Peter ii. 6.

THE BRICKMAKER.

WE might come next to the bricklayer, only that before bricks can be laid, they must be made; so we must first say a little about brickmaking.

Of course it is well understood that bricks are made of clay, hardened by fire; and it may seem a very simple operation, and very easy to perform; and it is comparatively so, but not altogether, for even a brick, to be well made, must have some pains bestowed upon it; and it is a maxim well worth remembering, that “what is worth doing at all is worth doing well.”

Bricks are not made wholly of clay, but have mixed up with this material a quantity of sand or coal ashes. The London brickmakers add about one-third part of ashes or small coal to the clay. It is found that this mixture makes stronger and more durable bricks than when clay alone is used.

The way in which they are made is as follows:—In the first place, when a suitable soil is found, the brickmaker has to dig up and prepare it for use. It is better for being exposed for some time to the air and weather, so that the usual practice is to dig it up at the end of one season for working upon the next. During the time it thus lies open, it should be frequently turned over to allow every part of the mass to be acted upon by the atmosphere; after undergoing this preparation, the ashes or sand are mixed up with the clay, and the whole is either ground up in a mill, constructed for the purpose, or thrown into a shallow pit and trodden by men or cattle, sufficient water being added to form it into a kind of stiff paste. It is then ready for the brickmaker, or rather for the

brickmaker's gang, as, in extensive brick-fields, there are generally six individuals employed in different departments of the business.

The first man further prepares and tempers the soil, in doing which he uses the following tools :—
1. A long hoe, made something like a mattock ; with this he pulls down the clay from the great heap, and brings it within reach of—2. A shovel, with which he chops, and beats, and turns over the clay, in order to its being more thoroughly mixed with the ashes. 3. A scoop for throwing water over the portion that he is working up with the shovel, to make it softer and more ductile. 4. A board, with which he kneads it together. This concludes his part of the business.

Then comes number two of the gang. He is generally a boy, and his business is to cut slices from this clay pudding, and take them to the moulding board. For this purpose he is provided with a sort of shovel, called a cuckhold, having a short handle and a concave blade. At the moulding-board there is another boy called a feeder, who has to cut off and roll out lumps of the clay thus brought, ready for the moulder. The moulder then takes his mould, which is a sort of wooden box without a lid, and just the size and shape, inside, of the brick intended to be made, and dips it into a heap of dry sand which is placed at one corner of the board ; he then throws the lump provided for him by the feeder into the mould, and strikes off the surplus clay from the top with a smooth flat stick, which he keeps by him in a pan, or tub of water. He then turns out the brick, thus far made, upon a board, and is ready for another lump. Another boy is at hand to remove the new made brick, and places it upon a barrow ;

and a fourth boy, when the barrow is loaded, wheels it away, and stacks the bricks for drying.

It is very likely that the reader has seen a brick-field, and has noticed the long rows of unburnt bricks that are thus built up like a low wall, only that they are not packed close together, a sufficient space being left between them to allow the air to circulate and dry them. These rows are covered with straw or fern, or sometimes they are stacked under a long tiled roof. This precaution is necessary to keep the direct rays of the sun from them, as well as to preserve them from heavy rains.

The bricks are then allowed to remain in these rows, or hacks, as they are called, until they are sufficiently dry for turning. If the weather be tolerably dry, this will take only two or three days. After they are turned, six or eight days more are required before they are in a proper condition to be burned.

Bricks are burned, as the young reader is aware, in kilns, which are a sort of large ovens. These are generally about thirteen feet long, ten or eleven feet wide, and twelve feet high; the walls are about a foot thick, not built quite perpendicularly, but leaning inwards towards the top, so that the kilns are smaller at the top than at the bottom. When properly filled they will hold 20,000 bricks. It is then covered over with broken tiles or bricks, and the process of burning is commenced.

Brick-burning, in order to be conducted successfully, requires considerable skill and management; for if too much or too little firing is used, the whole batch would be spoiled. The first step in the process is rather a continuation of drying than actual burning; and to effect this a gentle fire of wood is made, and kept up for two or three days,

until the smoke turns from a dark colour to a transparent one; the bricks are then ready for the last or real burning. The mouth of the kiln is now filled up with pieces of brick and closed with wet clay, leaving only just room enough at the top to receive a fagot; these fagots are made of furze, heath, fern, or other materials of the same nature, and the kiln is supplied with them until the fire appears at the top. The fire is then allowed to slacken for about an hour, and the kiln becomes gradually cool. The heating and cooling is repeated over and over again until the bricks are thoroughly burnt. There are methods of burning different from this, and different kinds of fuel used, such as coal and cinders, and a longer or shorter time allowed for burning, varying from forty-eight hours to twenty or thirty days, according to circumstances; but the method described will be sufficient to give a general idea of the process. After the bricks are burned they are left to cool gradually, and are then removed ready for the use of the bricklayer.

An industrious and quick workman can mould five thousand bricks in a day, working from five in the morning to eight at night.

The usual size of a brick is nine inches long, four inches and a half wide, and two inches and a half thick; and a duty to government is paid upon every thousand.

Tiles are made of the same clay as bricks, and it is part of the brickmaker's trade to furnish them, though sometimes tile-making is a business by itself. They are made of different shapes, according to the work for which they are intended. Those most frequently used for roofing are called plain tiles; they are quite flat and oblong in shape,

measuring not quite half an inch in thickness, nine inches in length and five in breadth. At one end two square holes are made, in which wooden pegs are put, by which the tiles are hung on the laths of the roof.

In some parts of the country pan-tiles are very much used for roofing. These are longer and broader than the plain tiles, and of a curved shape. In laying them on they are placed in rows from the bottom to the top of the roof, and the raised half of the tiles in one row laps over the lower half of the next, so as to keep out the rain.

Then there are ridge tiles, which are rounded to fit on the ridge or top of the roof, and are either oblong or angular, as they are intended for the top or side ridges.

The first mention made of brick in the Bible is in the projected building of the Tower of Babel, when the world began to be peopled again after the flood. You may read how they said one to another, "Go to, let us make brick, and burn them thoroughly. And they had brick for stone, and slime had they for mortar," Gen. xi. 3. The foolish and wicked men thought that they would build a city large enough for all to dwell in, without the necessity of being separated over the face of the earth; and a tower that should perpetuate their names to all generations. Now this was wicked, because they well knew that God intended them to spread themselves over the world in order that it might be replenished; and it was foolish, because they ought to have known that no design framed against the Almighty can prosper. It was so in this case, for by a single act of his will, God confounded their language, so that they could not understand each other, and were compelled to leave

off their brick-making and building, and to disperse themselves as God had commanded.

The young reader will no doubt remember another instance of brick-making mentioned in the Bible—that of the children of Israel in the land of Egypt. In the book of Exodus there is a very interesting, but sad account, of the manner in which they were afflicted by their cruel tyrant Pharaoh and the Egyptians generally. It is said that “the Egyptians made the children of Israel to serve with rigour: and they made their lives bitter with hard bondage, in mortar, and in brick, and in all manner of service in the field; all their service, wherein they made them serve, was with rigour,” *Exod. i. 13, 14*; and that they built two cities for Pharaoh, *Exod. i. 11*. And this was not all, for when at God’s command Moses applied to Pharaoh to let the Israelites go out of Egypt, instead of paying attention to his request, he added to their hard labour, and ordered that no more straw should be provided for them, but that they should go and gather it for themselves; and yet that they should make as many bricks in their day’s work as before, *Exod. v. 6, 7, 8*. This is another instance of the folly and wickedness of opposing God’s will, for by thus doing, this haughty king drew down upon himself and his country the heavy judgment of the Lord; and at last he and all his army perished miserably in their hardened rebellion, while God’s own people were delivered and brought out of the land of bondage “with a strong hand, and with a stretched out arm,” *Psa. cxxxvi. 12*. Let us never forget, that disobedience to God is sure to end in misery and ruin.

THE BRICKLAYER AND PLASTERER.

THE business of bricklaying includes, not only building houses with bricks, but roofing them with tiles or slate, raising walls, steyning wells, and paving with bricks, or tiles.

Besides bricks and tiles, the bricklayer makes use of mortar, laths, and nails for fastening them, and wooden pins for the tiles.

Some of the principal tools he uses are—a trowel, for spreading the mortar ; a brick-axe, for dividing or cutting the bricks to the size required ; a square, a bevel, a plumb-line, a level, a shovel, a hod, a rammer, a pickaxe, and a crow ; a line and a foot-rule are also indispensably necessary ; and so are poles, planks, and ropes for scaffolding, and ladders of different lengths.

Mortar is made of a mixture of lime and sand, with water. Of course the young reader knows very well that the use of it is to fasten, or cement, the stones, or bricks, in a building together ; and if he will just examine the next brick wall he may come near, he will find, particularly if it should be a very old one, that the mortar between the bricks is almost as hard as the bricks themselves, it being one of its qualities to harden with time.

There is another kind of mortar called tarras, which is used where the building will be constantly exposed to the action of water, as in bridges, cisterns, etc. The difference between this and the common mortar consists in the lime from which it is made being obtained from a peculiar kind of stone. It will be as well to say here that lime is chalk or stone burnt to a powder.

And now that we have supplied our bricklayer with bricks, mortar, and tools, we can set him to work, and see how he uses them. Let us suppose

he is building a wall;—the first thing he does is to dig a trench for the foundation, here his pickaxe and spade, or shovel, are put to use; the depth to which this trench is dug depends very much upon the nature of the ground; if it should happen to be a hard and firm bottom, perhaps a foot and a half or two feet will be sufficient; but sometimes the foundation is carried down much deeper. Having thus prepared this trench, and tried it with his level, to see that it is perfectly horizontal, his bricklaying work commences by spreading a tolerably thick bed of almost liquid mortar at the bottom of it, to receive the first course of bricks. Suppose our wall is to be the thickness of one brick, or nine inches, the first courses of the foundation ought to be thicker than the wall itself, in order to give more strength to the whole. There is nothing, young friends, depend upon it, like a good foundation, whether it be to a brick wall, or to education, to morals, or to religion. But now for the wall, for the mortar is waiting for the bricks; and since the wall is to be one brick in thickness, we must allow a brick and a half for the foundation. First, then, our bricklayer takes a brick and places it lengthways in the direction of his intended wall, taking care that it lies quite even, and presses it down on the bed of mortar; then a second and a third are laid side by side in the same manner, so as for the three together to make the required thickness; and, in the same manner, the whole of the first course is laid. This is called a stretching course, and the bricks are called stretchers. Having finished this to his satisfaction, he takes a lump of mortar and dabs it on the commencement of this first course, and begins with the second, the bricks of which are to be laid in an opposite direction, that is with their length

across the wall ; but as one brick will not reach from one side to the other, and two bricks will be too wide, it is necessary that he should cut one in sunder ; this is managed with a stroke or two of the brick-axe, and the half brick is laid end to end with the whole one, the broken part being, of course, put inside. In this manner the second course is carried on, the whole and the halved bricks being placed alternately. This is called the heading course, and the bricks laid in this direction are called headers. Having carried this brick-and-a-half work up to a sufficient height, the thickness of the wall is contracted to single brickwork, which still consists of alternate courses of stretchers and headers. The thicker work at the bottom is called the footing, and the projections are called set-offs.

This method of laying bricks is called English band ; there are three other ways, called Flemish band, garden-wall band, and herring band. English band is considered the strongest, but the Flemish is rather handsomer, and therefore much practised. The difference is, that in the Flemish band, both headers and stretchers are used alternately in every course.

But merely building up a plain brick-wall is one of the easiest parts of the bricklayer's work ; there are other operations which require much more skill ; the construction of arches is one of these. Some of the arches or viaducts built over valleys and roads to support the railroads which cross them at a great height above, are beautiful specimens of brick-work, combining, as they do, very great strength, with a lightness and elegance of appearance which it seems almost impossible to surpass.

Another part of the bricklayer's business is, covering the roofs of houses, when he has built up

the walls. For this purpose he must be furnished with laths, or thin slips of wood, generally made of deal, but sometimes of oak. These slips are from three to four feet in length, about three-quarters of an inch thick, and an inch and a quarter broad. They are nailed to the rafters of the roof in an horizontal direction, and at a sufficient distance apart for the tiles of one row to be about half covered by the row above. The tiles are then hung close together upon these laths by means of wooden pegs that are driven through the holes in the upper part of them. In many parts of the country, slates are used, instead of tiles; they are laid on in much the same way. The slates that are used for this purpose in London are brought from Wales, or Westmoreland, and are called by different names according to their size; some are called duchesses, some countesses, and some ladies—curious names these to give to the coverings for our houses!

But now we have been saying so much about the bricklayer and his work, we must not forget the bricklayer's labourer. If you are in the habit of taking notice of what you frequently see, you must have observed that while the bricklayer is at work in his regular department—that of building with his bricks, another man is always very near him employed either in mixing up mortar, or carrying it when it is made to his fellow workman, as well as in supplying him with bricks as fast as they are wanted. This man is called the labourer, and he is pretty rightly named, for it must be severe labour to carry that heavily laden hod on his shoulder, almost incessantly, from day to day.

A good workman, with the assistance of a labourer, can lay about a thousand bricks in a day.

And now a few words about the plasterer; for when the outside walls of a house are built, and the roof covered in, and all the carpenter's work finished—which we shall come to by-and-by—the inside would still be rough and unsightly if left in its first state. There would be no ceilings to the rooms, and the walls would be mere walls of brick and mortar, or stone (as the case might be), just like the outside of the house; and as well as being rough and unsightly, would be also uncomfortable. To remedy these defects, then, the plasterer must be set to work; and he is mentioned here because, as before noticed, the trades of bricklaying and plastering generally go together.

In plastering a ceiling it is necessary, first, to nail laths across the joists, so close as almost to touch each other; and then the first coat of plaster, which is, in fact, the same kind of mortar as is used for cementing the bricks together in building—with the addition of cows' hair, which is of use in binding together the mortar—is spread over the surface of the laths—perhaps, however, it would be more correct to say *under* the laths, as the mortar is certainly undermost. Well, this is left to dry, and then another coat of plaster of a finer and whiter quality is laid on, and spread very smoothly with a trowel. The trowel for the purpose, is of a rather different shape to the one used in bricklaying; and the plaster is made of white lime or plaster of paris. The walls are covered in the same manner, except that the plaster is sometimes laid on to the bare brick work instead of laths. When this process is quite completed, and the work is dry, the ceiling is ready for the whitewash, or colour brush; and the walls for the painter or paper-hanger.



THE CARPENTER AND JOINER.

WITH all the cleverness of the stone-mason, and brickmaker, bricklayer, and plasterer, it would after all, be a strangely unfinished house that they could build without the help of the carpenter. There could be no strong and yet light rafters to cover in with tiles ; no beams and joints to strengthen the building, and to lay down the flooring upon ; no boarded floors ; no window frames, or very clumsy and dark ones ; and certainly no doors ; besides a hundred other conveniences that it falls to the lot of the carpenter alone to supply. What a useful man is he then ! and as he is so useful, we find that his trade is a very old one too. It is mentioned several times in the Old Testament, where carpenters are described as being usefully and honorably employed in building the house of the Lord, 2 Kings xii. 11 ; for it is a great honour to

be employed even in the meanest occupation connected with the service of God; and let us hope that these carpenters thought so too.

But all the carpenters spoken of in the Bible, were not so well employed. What do you think some of them were engaged in? Why, making a god! a wooden god! a god to fall down before and worship! If our young friends will take the trouble—though surely it will not be thought a trouble—to read the 44th chapter of Isaiah, from the 9th to the 18th verse, they will find the process of god-making described, and the folly of it exposed and ridiculed. It is much to be feared that many who had been better taught, and had constantly the means of knowing much better, yet acted in this foolish and wicked manner. But while we blame them, do not let us forget that if we love anything better than God—if our hearts are set upon riches, or honour, or pleasure, or self indulgence,—we are idolaters too, though we do not bow down to “a stock or a stone.” The word of God reckons all those idolaters, who do not love the Lord their God with all their soul and strength and might.

The business of the carpenter, generally, is to prepare and put together all the wood work used in the building of houses, etc.: but it is divided into two branches; that part being called carpentry which relates to the outer or rougher work required; while the making of doors and window sashes, and all the finer work withinside, is called joinery; but the two branches are almost—if not quite—always carried on by the same person.

In carrying on his operations, the carpenter stands in need of a great many tools. He must have axes to shape his timber roughly before it can be applied to any use whatever. Then he re-

quires saws of very different sizes and construction, from the large toothed and heavy pit-saw that is worked by two men, to the small, delicate, and highly polished tenon saw, or the little narrow and spring like instrument that he has to use in cutting circular or wavy lines through his boards. Then he must have hammers of various sizes for different kinds of work ; several kinds of planes for smoothing the wood ; chisels for cutting it ; awls and gimblets for boring holes in it ; besides pincers, mallets, screw-drivers, rules, and many others. Altogether, a good set of carpenter's tools is worth a great deal of money, certainly not less than ten pounds, and if very complete, much more ; and as journeymen are expected to find their own tools, it is necessary, in the first place, that they should be saving, in order to procure them ; and, in the second place, that they should be careful of them when they have got them. There is a great difference in carpenters in these particulars ; some can never do a job of work in a house without leaving two or three of their tools behind them when they have finished, sometimes a hammer or a saw, very often a chisel or a screw-driver, and almost always a gimblet, or a bradawl or two. And another thing may be noticed in these same careless men, and that is, while they are at work, they strew their tools about in all manner of directions, here and there and everywhere, so that they waste as much time in looking for a gimblet, for instance, as would have been sufficient for making two holes with it when found. It need hardly be said that these men are very unprofitable workmen to their employers, as well as to themselves ; and it is to be hoped that the young readers of this book have been taught, and practise too, the very important

maxim :—" A place for everything, and everything in its place." It is not the carpenter only that finds the disadvantage of neglecting this excellent rule.

Will our young friends take a hint here, about carpenter's tools? Some little boys—yes, and big ones too—are very troublesome to carpenters when there happens to be one in their way. They will make nothing of going to his basket and taking a chisel, or a gimblet, or a hammer, or anything else that they may think they want, and using it without permission. Now this is not right; and no wonder if the carpenter is a little vexed when he finds one thing missing, and another thing injured, or rendered useless. Surely if a good natured youth knew what trouble this meddling often gives to the workman, he would never presume to use a carpenter's tool again without first asking leave to do so.

Alfred Benson was an industrious and clever little fellow, and his father had given him a few carpenter's tools, and some rough boards, to amuse himself with when he was not at school, or when it was too wet for him to work in his garden; and he had managed to make several useful little things—such as a set of shelves to hold his books, and a leg rest for poor widow Maxwell on the green, who was lame; and he was pleased to find that it was very comfortable for her to lay her lame leg upon as she sat knitting. One day, a carpenter was employed at his father's house, laying down a new floor and building a closet; and Alfred was very much pleased with watching his operations, and in handing him his tools as he wanted them; and when he had quite done, the little boy asked him to be so good as to show him how to make a

dove-tail joint to a box, which he was making for his sister. This the man was very willing to do, and told him, that if he liked to come some day to his master's work-shop he could see all the men at different kinds of work ; and he was sure his master would have no objection to such a useful and careful lad being admitted. Alfred was very much pleased at this, and asked his father if he might go. His father told him that he might, and that he himself was going to Mr. Brown's—which was the name of the carpenter—in a day or two, and that then he should go with him.

As they were going to Mr. Brown's, Alfred's father told him a little about the different sorts of wood that were principally used in carpenter's work. He said that oak was the most durable of all the wood in common use, and that formerly it was more used than any other in the building of houses, and that many old buildings had no other kind of wood in them ; that the beams, and joists, and rafters, and staircases, and floors were all made of oak, and were as sound and strong now as they were when first laid down ; but that of late years oak timber had become more scarce, and being thus dearer, as well as hard to work upon, deal or fir wood had come into much more general use.

“ And does this wood grow in England ? ” Alfred asked.

“ A little is grown in this country,” said his father ; “ but the greater part of what is used comes from abroad. Large quantities are imported from Norway and Sweden ; some from Russia ; and some also from Canada.”

“ And are any other sorts of wood used in building ? ”

“ Yes, several, but not so generally—beech, elm, poplar, and many others are occasionally used ; but deal is now the staple material of the carpenter.”

When they reached the carpenter’s yard, Alfred saw two or three large trunks of trees lying on one side of it, and he asked his father if these were fir trees. His father told him that two of them were, but that the third was an oak ; and he desired Alfred to notice the difference between the two sorts. The fir trunks were longer and straighter than the oak, and tapered off gradually from one end to the other ; and the bark was of a different texture.

The next thing that attracted Alfred’s attention was a saw pit with two men at work, sawing a large piece of timber into boards. His father showed him that this was the trunk of a tree ; but that it had been roughly cut square by the axe before it was brought to the saw pit ; and that the upper surface of it was marked with chalk lines from one end to the other, to guide the top sawyer in cutting it. Alfred observed that when the men had sawn a little way down one of the lines, they stopped while the one at the top drove a wedge into the cut ; and his father told him that this was to keep it open and give more room for the saw to move up and down with ease. He showed him, too, that the teeth of the saw were bent aside, one, one way, and the next in the opposite direction, in order that the cut which they made should be a little thicker than the back part of the saw, and that this prevented the saw from being jammed in the cleft that it had made.

As they moved on—“ Why, there is the roof of a house,” exclaimed Alfred, “ but how can they get it out of the yard, or on to the top of the house ?”

“It will be taken to pieces again,” said his father, “and put up piece by piece ; they are only fitting it together now, to try it.”

He then pointed out to his son, the different timbers of which it was composed, and told him that the pieces that slanted from the bottom, and met, from each side, at the top were called rafters ; and that a large beam that laid across from the bottom of one rafter to the other on the opposite side, was called a tie-beam, or girder ; and the upright timber that reached from the middle of this tie-beam to the top of the rafters where they met together, was a king-post. Mr. Benson showed him, too, how some of the pieces were fastened together by a mortice joint, which is a square hole cut in one piece of wood with a very thick kind of chisel, called a mortice-chisel, into which the end of another piece of wood is made to fit exactly and tightly ; and that the square hole is called a mortice, and the part that fits into it is called the tenon.

After looking at this frame work, Alfred and his father went into the workshop, which was a large building like a barn, and round the sides of which were several work-benches, with men by them, at different kinds of work, some planing, some sawing, and some hammering. Overhead were a great many boards of different lengths and widths and thicknesses, lying across the beams of the building, ready for use when wanted. Alfred when told that the boards were sawn by a mill, was very anxious to know how a mill could be made to saw large trees into boards, and his father told him that he would, some day, describe a saw-mill to him, and, perhaps, take him to see one. Presently, at one of the benches, Alfred saw the

workman who had been at his father's house, and he went to see what he was doing. He was planing a long board, like those overhead; and the man told him that it was intended for flooring a room, and showed him a great many that he had finished, and that were standing up on one end beside the bench. Alfred noticed that one side of the board was planed much smoother than the other and he supposed that the smooth side was intended to be laid uppermost. His friend, the carpenter, then showed him another man who was preparing some narrower and thicker pieces of timber, and told him that these were intended for the foundation of the floor, and were called joists.

Just then Alfred's father beckoned him away, and told him that he had transacted his business with Mr. Brown, and was ready to go home.

As Mr. Benson and his son were returning, Alfred said to his father—"Do you think that Jesus Christ really did work as a carpenter?"

"Most likely he did, my dear boy. It is supposed that he lived with his reputed father till he was thirty years old, and we know that when he had commenced his great work of making known the gospel, he was taunted with being the carpenter's son. But why do you ask?"

"Because, I think it must be very pleasant for carpenters now, to think that they are in the same trade that the Saviour once was."

"No doubt it is, if they love the Saviour. It is a very great honour put upon the employment, that the Son of God should have condescended to practise it. How wonderful it is to think that He who, in the beginning, created the whole universe out of nothing, should have stooped so low as to

become so humble ! And do not forget, my boy, that He stooped lower than this ;—that he not only ‘made himself of no reputation, and took upon him the form of a servant, and was made in the likeness of men ;’ but that ‘he humbled himself, and became obedient unto death, even the death of the cross,’ Phil. ii. 7, 8. And remember why he did this. To save sinners ! And to do this, nothing was too low, as far as the estimation of the world went, and nothing too laborious ; and by suffering himself to be called the son of a carpenter—a mere mechanic—he has taught us an important lesson, never to look with scorn upon those who earn their daily bread by daily labour.”





THE PLUMBER, PAINTER, AND GLAZIER.

THESE are very different handicrafts; and the materials used in each of them have very little connexion with those used in the others. We cannot say exactly, why the tradesman who works upon lead should, almost always, be a worker upon glass too; or why the same man who lays down the gutters, and makes the cisterns, and puts in the windows of our houses, should be necessarily employed to paint them. Sometimes, indeed, each of these departments of trade are exercised separately; but, as a general rule, they are combined; and the plumber, painter, and glazier, are one and the same individual. This being the case, then, they are classed together here; but each of the branches of the trade will be spoken of separately. Let us begin with plumbing, or lead-working.

Lead is a very soft metal, and is found in mines. The principal lead-mines in England are in Somersetshire, Derbyshire and Northumberland. It is found, like most other metals, mixed with ore, which is broken into small pieces, and well washed, to free it from dirt; after which it is put into a furnace, to separate the metal from the ore, by melting the former. It is then ladled out of the furnace into moulds of an oblong form, and the lumps of lead thus cast are called pigs, each weighing about 154 pounds. These pigs are now ready for the lead merchant, who again disposes of them to the plumber, either in the same form, or re-cast into sheets.

Lead is used by the plumber, in making cisterns, water-pipes, roofs and gutters for houses, and the inner frame or lattice work for windows. The tools he requires are few and simple. He must have hammers, planes, and chisels, and gouges of various kinds and sizes, but nearly of the same construction as those used by the carpenter. Measuring rules and compasses, too, are necessary; and so is a chalk line like that which Alfred Benson saw used by the sawyers. Besides these, the plumber makes use of iron ladles for melting lead or solder; soldering irons; dressing and flatting tools, which are made of hard wood; and strong knives for cutting the lead.

The principal form in which lead is used by the plumber, is in sheets, which he either purchases already cast, or casts himself from the pigs which he purchases of the lead merchant. If he casts them himself, he is provided with a casting-table, about twenty feet long and six feet wide. This table must be very strongly made, and is covered with smooth planks closely fitting together and

having a border of wood three inches thick and four inches above the level of the table; thus forming a mould. This mould is then partly filled with fine dry sand, which is carefully levelled, that there may be no inequality on the surface.

Having thus prepared his casting-table, the plumber puts as much lead as is required for the sheet he is about to cast, into a large iron pot or cauldron, built for that purpose over a furnace at a convenient distance from the table. When the lead is melted, it is ladled out of the pot into a trough at the end of the table, and which is as long as the table is broad. The trough is then lifted on one side for the lead to run over and spread upon the mould; and a wooden instrument called a strike is passed over it by two men, in order to produce an equal thickness of the melted metal, which is then left to cool, after which it is rolled up for future use.

Sheet lead is made of different thicknesses, to suit the different purposes for which it is used. These thicknesses vary from one-twelfth part of an inch, to an inch. A square foot of lead an inch in thickness, weighs fifty-nine pounds.

And now that the lead is formed into sheets, we have to see how it is applied by the plumber to the purposes of his business. It has already been said, that it is principally used for making cisterns, and gutters for houses, and sometimes for entirely roofing a building. In each of these operations, the plumber will have occasion to join the lead; and to do this, he makes use of a cement called solder. This material is a mixture of lead and tin, melted together, and is used in the following manner:—The two edges which are to be joined, are scraped quite clean, and some powdered resin,

or borax, and tallow, is laid upon them before they are put together. The solder is then melted in an iron ladle and poured upon the joints; while at the same time, a hot soldering iron is passed over the lead to render that sufficiently hot to unite with the melted solder. This operation requires some skill and nicety. The soldering iron is somewhat the shape of an acorn, only much larger, and is fastened by a stout iron wire to a wooden handle.

In making cisterns, the four sides are formed by one piece of lead, bent into the proper shape, so as to require but one joint; the bottom is soldered on afterwards.

In roofing a house or other building with lead, it is necessary to have an under roof of wood or plaster upon which to lay it; and though a leaden roof does not require to slope so much as one of tiles or slates, it should not be made quite flat, as the rain will, in that case, remain upon it until dried up by the action of the air and sun; or, what is more likely, until it finds out some little crevice in the roof, through which to soak into the apartments beneath.

There are two methods of joining the sheets of lead used in roofing, besides that of soldering. They are called rolling and overlapping. In rolling, a long slip of wood is placed under the edge of one of the sheets of lead. This slip is about two inches thick each way, and is flat on the under surface, and rounded on the upper. The edge of the lead is then hammered down close upon this slip, so as entirely to cover it, and over this, the edge of the next sheet of lead is brought and hammered down too. This plan is very effectual in keeping out water—more so,

even, than soldering, because it allows the lead to contract in cold weather and expand in hot weather, which soldered joints do not admit of, and thus cause the lead to crack in other parts. Overlapping is performed by folding the edge of one sheet over the edge of the adjoining one, and hammering them closely down upon the surface of the lead ; but this plan does not answer so well as rolling, for keeping out rain.

The most common thickness of the lead used in roofing or guttering is about the eighth of an inch ; and in laying it down, the plumber employs his dressing and flatting tools, which are made of different sizes and shapes, according to the kind of work. The principal care required, is in flattening the lead close down to the under roof, or foundation, in every part ; and, in consequence of the softness of the metal, this is not very difficult to accomplish. The joints, in guttering, are always soldered.

Lead roofs are very seldom, if ever, placed upon common dwelling-houses ; and in large mansions where a great deal of that material is used, it is more for terraces than for entire roofs. But churches are sometimes quite covered with lead, to the exclusion of slates and tiles ; and many old castles and abbeys, and other substantial fabrics of past ages, were principally roofed with it.

Another very important use to which lead is put by the plumber, is that of water pipes. In London and other large towns, these are so essential to the comfort and health of the inhabitants, that we wonder how our ancestors used to manage without them. They are laid on to almost every house, so that at a very trifling annual cost, the inhabitants may have as much water as they

require, without even the trouble of stepping out of doors to fetch it.

The manner of making these water-pipes is very curious; but as the plumber generally purchases them ready for his use, it does not fall to our lot to describe it here. It may not be amiss, however, just to say that they are cast in a mould, through which a steel rod, the size of the inside of the intended pipe, is passed; and that they are afterwards drawn, by powerful machinery, to the proper thickness. They are then coiled round and round in the form of a hoop, and sold to the plumber.

Other parts of the plumber's occupation are—the management and fixing of pumps and water closets—the conveyance of rain, from the roofs of houses and gutters to the ground, by means of pipes of a different construction to the water-pipes just mentioned, the providing and fixing of taps to water and other pipes, and the manufacture of leaden lattice, or casement frames, for church and cottage windows. This last part of the business seems to be the only one that connects it with glazing; and it is not unlikely that it is owing to this connection that the two trades are now generally combined.

Besides the sheet lead already spoken of, the plumber uses what is called milled lead, which is made by passing the sheets between large rollers to make them thinner and harder. This operation renders the metal more brittle also, and therefore, less adapted for roofing and guttering; but for some purposes it is used to great advantage. Zinc is also very much used for many purposes to which lead was formerly applied. It is a lighter and cheaper metal than lead; but not so soft, or malleable.

There is one more department in the plumber's business, and the last one to be mentioned here—that of making leaden coffins. For these, sheet lead is used, and the body, after being first placed in a plain wooden coffin, called a shell, is enclosed, and carefully soldered down in the leaden one, which is again put into an outer coffin of wood, before the cold, lifeless clay is consigned to its final resting-place. Oh, what pains, and care, and expence are lavished upon our bodies! While living, what grand and substantial dwelling places do we raise for their comfort and convenience! With what anxiety do we provide for their maintenance and preservation! How often is the question asked, "What shall we eat? or, what shall we drink? or, wherewithal shall we be clothed?" Matt. vi. 31. And when this care and anxiety no longer avails; and the stern decree reaches us, "Dust thou art, and unto dust shalt thou return," Gen. iii. 19, how fondly do we endeavour to screen our poor insensible bodies from corruption and decay! But what will it avail us, dear young friends, that our mouldering flesh is encased in all the security of oak and lead and mahogany, if our spirits should be eternally lost? or what matters it how insecure and frail may be our last "small, narrow house," if our souls be everlastingly saved? Let it be our great concern to seek for pardon, and peace, and eternal life, through the Lord Jesus Christ, by faith in his atoning sacrifice, and by obedience to his gospel, and then we shall not be much concerned about our perishing bodies after the soul has departed to be with Christ.

Let us now pass to the next department in the trade—that of painting. After a house is built, it is desirable that it should be preserved, as much as

possible, from decay. It is well known that the action of moisture and air combined, is injurious to many substances; and particularly so to wood and iron. Now as there is a great deal of wood and iron work in almost every building, it is a matter of great importance that some means should be adopted to screen these materials from too close a contact with the atmosphere. Then, again, it is of some importance that our dwellings should present an agreeable aspect to the eye—that they should, both withinside and without, look cheerful and lively. If we were to take up our abode in a new house, and were to furnish it with every convenience to which we had been previously accustomed, and the house were to prove dry, and air-tight, and commodious—we should yet feel somewhat uncomfortable, and our eyes would be really pained, if they rested only on bare plastered walls and plain unpainted doors, wainscots, and window frames. We should feel something wanting in our new habitation. It is in this twofold manner that the painter proves himself very useful. He paints the outsides of our houses, as a matter of necessary economy, and the insides, as one partly of desirable and innocent luxury, and partly for their better preservation also.

The substances used by the painter for the various colours that he uses, are generally purchased by him in the form of dry powder, which he mixes with other ingredients to bring them into a liquid state.

The most common of the liquids used by painters is linseed oil, which is obtained from the seeds of the flax plant. Before it is used, it is necessary that it should be boiled, in order to

destroy some part of its fatness, which would prevent its quickly drying. There is another kind of oil, very much used by the painter. It is procured from different sorts of nuts, and is called nut oil. This also requires boiling before it is fit for use. Another sort of oil is obtained from turpentine, and is known by painters under the name of turps. This oil is mixed with the one already mentioned, and is very useful in causing the paint to dry quicker than it otherwise would; and in preventing too great a glossiness in its appearance. It is sometimes used without any mixture of nut or linseed oil.

The paints thus made by a mixture of powders with oils of different kinds are called oil colours; but there are other liquids that are used, which are more economical, and which, when employed in colouring the walls of rooms, answer the purpose sufficiently well, though they would not do for out-of-door work. These are obtained by boiling glue, parchment, or parings of hoofs, in water, thus making an adhesive or sticky liquid; sometimes beer and milk are used for the same purpose. The laying on of colours thus mixed is called distemper colouring, or painting.

The preparing of his colours for use, is a point of importance to the painter; for this purpose he is provided with a grinding-stone and a muller. The first of these articles is a smooth flat slab of marble, and the muller is a large stone or pebble, somewhat in the form of an egg, only larger—with one end ground down to a flat surface. In using these he first puts a small quantity of the dry powder upon the centre of the stone, and after dropping a little oil upon it, rubs it round and round with the flat end of the muller; and as the powder and oil be-

come completely mixed, he removes the mixture from the stone into the paint pot with a spatula, which is a broad, thin, and elastic knife, such as the young reader has probably seen used in a chemist's shop. This process of colour mixing is called grinding. After being thus ground, more oil is mixed with it to make it sufficiently thin for use.

Having thus prepared his colours, the painter's next work is to use them, or, as it is termed, lay them on. For this purpose he must have brushes, which are of different sizes ; some of them are small, not more than a quarter of an inch in diameter, and the largest are about three inches. They are made principally of hog's bristles, large quantities of which are annually imported from Russia for this and other purposes.

In painting new work it is necessary, in the first place, to cover the knots of the wood with some substance to fill up the pores, and produce a uniform surface. A mixture of red-lead and oil, or spirits of turpentine, is made use of for this purpose, and the process is called knotting.

After this, the first coat of paint is applied ; this is generally made of white-lead, oil, and turpentine, and is called priming. When this priming is dry, the nail-holes are carefully filled with putty, and then the second coat is laid on, and then a third, and a fourth, until the painter arrives at his last and finishing colour. In new work a greater number of coats are necessary than in old, or where the paint needs only renewing. The art of using the brush can only be acquired by practice ; a good and experienced workman will use far less paint, and produce a much better effect, than a novice in the employment ; for this reason young beginners are always set to knotting and priming before they

are allowed to put their hands to the finishing work.

The trade of a painter, so far as we have thus briefly noticed it, does not require a great deal of skill and ingenuity. We have seen that the powdered colours are prepared for him, and all he has to do is to grind them with oil to a proper state for use ; a little practice and common attention is sufficient for this part of his business. Then the art of laying on plain colours is not difficult to acquire ; a lad who has practised for a short time in knotting and priming, and who is careful to observe his master's method of painting the finishing coats, may soon reckon himself capable of undertaking this too. But there are higher departments in the business that almost place it among "the fine arts," and in which few painters, comparatively, attain to perfection. These departments are called, marbling and graining.

Marbling, as the name implies, is the art of imitating the colour and rich veins of marble on wood. These imitations may be produced, either by oil or distemper colours. Of course, the first is always used when the work is to be exposed to the action of the weather. No doubt the young reader has often admired the beauty of a fine polished marble slab, and has noticed the deep contrast between the delicate white of the ground, and the dark coloured or red veins that intersect it in all directions. It is only in a close observation of these, and a careful imitation, combined with practice, that the talent of the painter can be successfully exercised. There is a great variety of differently coloured marbles—some have black, some grey, some red, and others green grounds ; and the colours of the veins are also different. The painter, therefore, should not

be satisfied with the ability to imitate one sort, but should endeavour to excel in all.

Graining is the imitation of the roots and grain of different kinds of wood of any kind sufficiently handsome to reward the painter's ingenuity, and the price of which is sufficiently high to render the exercise of his ingenuity profitable.

We must now bring this account of the painter to a close, although we have only glanced at his operations. There are some parts of the business that are dirty and disagreeable, and it is not a healthy one on account of the fumes of the paints that are necessarily used. White-lead is a particularly unwholesome substance, and the only way for the painter to preserve himself from its bad effects is, to pay great regard to cleanliness of person and sobriety of habits. But setting aside this great disadvantage, the higher branches of the trade are interesting, and give much room for the exercise of talents and industry; and instances have been known of ornamental house painters rising to eminence as artists.

We come now to the glazier. We all know very well how useful and comfortable are glass windows, and feel disposed to pity the inhabitants of some parts of the world, whose best substitute for this convenience is the half transparent membrane of a fish. We should remember, however, that some centuries ago our ancestors were not much better off; oiled linen cloth or thin pieces of horn, similar to those now used in common lanterns, were the best substances they could obtain for the admission of light into their houses. Even when glass was introduced into this country, the use of it was long confined to churches and the residences of the nobility; and in the latter they

were only used when the owner of the mansion was "at home," at all other times they were removed for fear of injury from accident or weather. The case is very different now, for almost the meanest hovel in England boasts a few panes, at least, of a material of which, in all probability, the palaces of many of its early kings were entirely destitute.

This is one of the many instances in which the advance of civilization and knowledge, gives increased employment and comfort to the inhabitants of a country. How many thousands of families are now supported by the manufacture and use of this one luxury, perhaps it may be called, but we may almost say, necessary of life !

There is reason to suppose that the manufacture of glass was practised in other countries long before it was introduced into this ; indeed, for a long time after it was partially used in England, it was imported from the continent, but the case is greatly altered now.

Glass is procured by melting together sand, pearl-ash, salt-petre, and a small quantity of magnesia ; one or two other articles are sometimes used, according to the kind of glass to be made. A very intense heat is required for melting these materials, and furnaces, of a peculiar construction, are built for this purpose. When the process of melting is sufficiently advanced, a hollow tube is dipped into the liquid mass, and turned round until a sufficient quantity adheres to the end, it is then withdrawn, and blown out by the breath of the workman into large globes, which, being separated from the end of the tube, are brought into a flat, circular form, before the glass thus made becomes cool and brittle.

The size of these circular sheets is from five to seven feet in diameter ; they are then cut into two pieces, for the convenience of packing and carriage, and in this form reach the glazier under the name of crown glass.

Almost the only tools required by the glazier are, a diamond, for cutting the glass ; a measuring rule, for taking the dimensions of the window frame to be glazed ; a lath, for guiding the diamond in cutting, just in the same way as a flat rule is used in drawing straight lines on paper ; and a knife, for laying on the putty after the pane of glass is fitted to the frame, as well as to cut away the dry and hard putty from frames which he is re-glazing ; and in this operation he sometimes makes use of a hammer. The only material that he uses in this part of his business, besides the glass, is putty, which is a composition of white-ning and linseed oil.

Formerly, the frames of windows were made of lead, but the use of this is now nearly done away with, by the introduction of wooden frames, except in churches and country cottages. These leaden frames do not require the use of putty, being made with a groove, into which the glass is slipped, and afterwards secured by pressing each side of the groove close to the glass.

The operation of “ putting in a pane of glass ” is of such a common occurrence, that the probability is, there is not one of our young readers who has not witnessed it. Perhaps they have each of them, at some time or other, made it necessary by their own carelessness ; or, it may be, by playing with improper toys in improper places. But sometimes accidents do happen without carelessness or fault, and we all know that glass is a very brittle substance. Well, however this may be, it

is not an unusual thing for a window to be broken, nor for young folks to stand by to see the mischief repaired. They will have noticed that the glazier makes use of his knife, which is strongly made and of a peculiar shape, to remove the broken glass and old putty from the wooden bars, or framework of the window. When the former pane has been in the window for some years the putty is very hard, and sometimes requires to be softened with acids before it can be removed. After this has been effected, the glazier takes the exact measurement of the vacant frame, and proceeds to cut his glass to the right size. The instrument that he uses is the diamond.

The diamond is a precious stone, and is perhaps the hardest thing in the world. The glazier's diamond is a small piece of this stone, set into a metal socket, which is fastened to a straight wooden handle for the convenience of cutting. Care must always be taken, in fixing the diamond into the socket, that it has a portion of its natural edge, as that is the only part that is valuable for cutting glass. And now we will go back to the glazier.

Having taken the measure, he selects a piece of glass suitable for the present purpose, and laying it on a perfectly flat surface, as a table or board, he proceeds to measure the glass and notch it with his diamond at the intended corners, in the same manner as we should mark a sheet of paper with a pen or pencil, if we wished to cut a piece of any particular size out of it. He then lays his lath across the glass, and with a single stroke of the diamond, divides it in two, as easily as we could draw a line on paper with a pencil and ruler.

The pane of glass being thus cut to a proper size, the glazier spreads a bed of putty in the groove of the window with his putty knife, and

then slips the glass into the groove, gently pressing it against the putty ; then he lays more putty round the edge of the glass, pressing it with his knife into any little vacancy that may occur between the glass and the frame, and then neatly scrapes the superfluous putty away, leaving only a slight rim sloping from the edge of the frame to the glass. Last of all he takes away with his knife the putty that was squeezed out between the glass and the frame.

It has been already said that the use of glass for windows is not many centuries old in England. There is no doubt that it was used earlier on the continent of Europe, but the art of glass-making is still much more ancient. It was probably not unknown to the sacred writers, though the allusions to glass that are found in the Bible must be understood as referring to mirrors, which, at that time, were made of polished metal. Certainly, windows of glass were not used in Jewish buildings, their windows were simply wooden lattice-work, which, though not inconvenient nor uncomfortable in a hot country, would prove but a poor substitute for our securely glazed casements.

And now we have gone through some of the principal trades connected with house-building ; we have said a little about the stonemason, the bricklayer and plasterer, the carpenter and joiner, and the plumber, painter, and glazier. But there are other trades, without which it would be difficult to build a modern house. There is the smith, who furnishes the iron-work ; the nail-maker, who provides the carpenter with nails ; the iron-tool maker ; the lime-burner ; and many others, who contribute something to the building of even the smallest habitation ; and then those in their turn,

are assisted in their occupations by other tradesmen ; so that before a single house is finished building, the probability is, that hundreds of persons have, in one way or other, assisted in its completion. This is as it should be ; for we were sent into the world to be useful to each other ; and when all men understand this principle better, and act more upon it in a right spirit, and from Christian motives, it will be a happier world to live in than it is now.

Before we have quite done with house-building, let the young reader be reminded that however complete and comfortable and desirable a house may be made, by care and expense in building, and however capable it may be of standing for many years, and of keeping out wind and weather, there are some things that it cannot keep out, and some things that it ought not to keep out. It cannot keep out sorrow, for “ man is born unto trouble, as the sparks fly upward,” Job v. 7. It cannot keep out sin, for we carry a sinful nature about with us wherever we go. It cannot keep out death, for “ it is appointed unto men once to die,” Heb. ix. 27 ; and death enters the palace as easily as the cottage. Neither can it keep out the eye of God, for “ the eyes of the Lord are in every place, beholding the evil and the good,” Prov. xv. 3 ; nor the anger of God, for he “ is angry with the wicked every day,” Ps. vii. 11.

And then, as to what it ought not to keep out. It surely ought not to keep out “ the fear of the Lord,” and as this is “ the beginning of wisdom,” Ps. cxi. 10, if once it enters it will bring many other things in its train. It will bring comfort for the present, and a joyful hope of everlasting life—everlasting happiness, and everlasting habitations in another and a better world.



THE SHOEMAKER.

It was a fine autumn morning on which Edward Brown stepped on to the deck of a steam-boat with his uncle, whom he was to accompany to London on a visit. There was another gentleman in the steamer, with whom, it appeared, Edward's uncle was acquainted; for they accosted each other by name; and soon entered into friendly conversation. As Edward did not seem much interested in this conversation, and soon became tired of looking about him, his uncle took a book from his great coat pocket, and told his nephew that he might, if he pleased, amuse himself with its contents. Edward was fond of reading, and soon began to turn over the leaves of the book. He had been thus engaged for about half an hour, when his uncle heard him say to himself—but in a tone a little above a whisper—"Well; I should not have thought it."

“What should you not have thought?” his uncle asked.

Edward looked up a little confused; for he did not know that he had spoken loud enough to be heard. “It was something I was reading, uncle, about the number of people that help to make a pair of shoes.”

“Indeed!” said his uncle. “Well, if it is not very long, I should like to hear the passage read. Do you think you can manage to read it aloud?”

“I will try, uncle.” And Edward began—
“The leather is stripped in the form of skin from the carcase of an animal, bred by a farmer or grazier, and this skin is prepared by the tanner, and dressed by the currier, previous to its being cut, shaped, and put together by the shoemaker, and his assistants. In putting the different parts of a shoe together, waxed thread is used; the wax being a composition of substances usually imported; and the thread spun by a twine-spinner, of hemp, which he obtains from the flax-dresser, who either imports the article, or purchases it of the grower. And before a single nail can be driven into the sole of a shoe, the miner must be at work in getting iron ore; the smelter, in separating the metal from the dross with his furnace; the forger, in beating out the pig iron into bars or rods; and the nail-smith, in reducing the iron rods to the size and length required. But the nail-smith, the forger, the smelter, and the miner; the twine-spinner and flax-dresser; the shoemaker, the currier, and the tanner—all use a variety of tools in their respective operations; which tools are made by other artificers. And the commodities imported from abroad are brought across the sea in ships, which must be

constructed, fitted out, and navigated, by ship-carpenters, riggers, storekeepers, and sailors.”*

“Very good, Edward; but how is it that you have not thought of this? You did not suppose that the materials could come to the shoemaker without hands.”

“No, uncle; I suppose I never thought about it.”

“I see,” said the gentleman, their fellow traveller, “that the writer has forgotten the last maker; and has not enumerated the different workmen employed upon the shoes after the materials are provided. A pair of shoes, in making, generally passes through three or four pairs of hands, except where the business is too small to admit of this division of labour. Indeed, there are few workmen who excel in more than one branch of the art.”

“I should have thought,” remarked Edward, “that shoemaking was a very easy business to learn.”

“This is a mistake, my young friend; I believe it is a difficult trade to become completely master of. I have been told by a very intelligent shoemaker, that after a man has been seven years an apprentice and seven years a journeyman, he finds he has not near learned all that is to be learned in the trade.”

“Fourteen years in learning to be a shoemaker!” exclaimed Edward. “What can there be to take up so much time as that?”

“If you like, I will tell you a little about it;” said the gentleman. “In the first place, when you order a pair of shoes, you expect that your shoemaker

should make them of good leather ; and in order to this, he must be a good judge of leather. But it needs much experience and observation for the tradesman to obtain this knowledge ; and thus it too often happens that he is very ignorant of this part of his business."

Here Edward inquired of what leather shoes were made.

" Principally from the skins of calves and sheep, and sometimes of goats, seals, and other animals : the soles are made from the stouter hides of oxen and horses. The next thing to be done with the leather," he continued, " after purchasing it, is to cut it up, or trench it, as it is called in the trade. Here, the shoemaker has need to be skilful and careful too ; for leather is a dear article, and he may soon waste several shillings by bad management. A good cutter will cut up a skin so that every part of it may come into use ; while an indifferent one will find, at last, that he has a large heap of waste pieces left, that are of no use except for mending, and perhaps not always for that. There is an old proverb that says, ' it is easy to cut large thongs out of another man's leather ; ' that no doubt took its rise from this circumstance. Then the cutter must bear in mind that the skin is of an unequal thickness, and accordingly he should take the corresponding part of the shoes he is cutting out, as near as possible from the same parts of the skin.

" There are three pieces of leather in the upper part of the common shoe : the front piece, which covers the foot, is called a vamp, and the two pieces that fit to the side of the foot, and are joined at the heel, are called quarters. These being cut out, are given to the shoe-closer, together with the

lining and binding. This is the easiest part of shoe-making, and is often performed by women.

“After this closing is completed, the shoes are passed to the shoe-maker, or shoe-man, as he is called, in order to their being bottomed, or soled. Here, more skill is necessary. First of all, the leather for the bottoms—which consists of an out-sole, an in-sole, and strips of leather that are placed between the outer and inner sole, called welts—has to be welted. This done, the inner sole is lasted, and put in the sun or by the fire to dry; and the outer sole is stretched and hammered on the lapstone ready for future use. By this time the inner sole is nearly dry, and has to undergo some further preparations, called rounding, feathering, and holing; that is, the form of the heel part is to be produced, the sole to be pared off to a thin edge all round, and holes to be pierced with an awl, ready for sewing.

“This done, the upper leathers are tacked on to the last—an operation that requires much care and some skill; after which the shoe is ready for sewing.”

“I have seen shoemakers sewing,” said Edward; “and have wondered how they could feel to put their thread through the small holes made by the awl, so easily as they do—and without a needle too.”

“This is soon learned,” answered the gentleman; “practice makes many things easy, which, at first sight, appear difficult: besides, though the shoemaker does not use a needle, he has a very good substitute for one in a hog’s bristle.”

“A hog’s bristle!” said Edward.

“Yes; this, twisted into the end of his thread, is more serviceable than any needle.”

“And why do they wax their threads in sewing?” Edward asked.

“For one very sufficient reason,” replied his friend; “to preserve the work from the effects of the weather. If the fibres of the thread were not coated with some substance which damp or wet could not penetrate, it would soon become rotten and break in sunder, long before the shoes were worn out.

“In sewing,” their fellow traveller continued, “the shoemaker makes use of an instrument called a stirrup. This is a leather strap placed over the last on the left knee, and held firmly down by the left foot; and he generally wears a hand leather, which is a piece of stout leather fitting on to the back of the left hand; the use of this is to keep the thread from chafing the hand, and to enable him to draw his stitches tighter.

“But I must not take up too much time in describing these little matters, or we shall get to our journey’s end before I have done; so I will only say, that after the inner sole is done with, the welt is to be added; and after this, the bottom of the sole is to be levelled, by filling up the hollow part with pieces of waste leather, which are pasted down, and afterwards pared off smooth, that the outer sole may lie flat and even.”

“Ah,” said Edward; “I know very well, when my shoes begin to wear out and want new soling, that scraps of leather come out from above the sole; and I thought it was a rogue’s trick of the shoemaker to put them there, and make believe that the sole was stout and strong.”

“Older folks than you have thought so too,” said the gentleman; “but they were unjust to the shoemaker, for want of knowing better. Your

shoes would wear out much faster, if it were not for these pieces of leather. Well, there is one thing more to be done before we come to the outer sole, and that is, to put a piece, called the split-lift, round the heel, upon the inner sole. This is fastened on with small wooden pegs.

“The outer sole, having been prepared by wetting and hammering, is now pasted with the thick paste used by shoemakers—and which, I dare say, you have seen—on the rough side; and the bottom of the shoe, so far as it is made, is pasted too. Then these pasted parts are put together, and three or four tacks are driven through the sole into the wooden last on which the shoe is still fixed.”

“I have noticed,” said Edward, “a kind of small hole in the soles of a new pair of shoes, but I did not know before what was the use of it.”

“Well, when the sole is thus tacked to the last, the shoemaker first rounds it, or pares off the edge of it with a sharp knife; then he cuts a channel round the outer sole to receive the thread, and then he commences stitching it on. In this part of the work the stitches are taken in a slanting direction through the welt, into the channel prepared to receive them.

“Last of all, comes the heel, which is composed of one or two pieces called lifts, and a top piece, which are fastened on to the sole by pegging and sewing.”

“And then, I suppose, the shoe is finished?”

“Not quite; it has to pass through several little operations before it is fit to send home to the customer; but the principal part is done; what follows being a sort of polishing off; and perhaps I have told you enough to give you some little idea of the manner in which a pair of shoes is made.”

“I am much obliged to you, sir,” Edward replied; “there is more work in making a shoe than I thought; but does it take so long as fourteen years to learn it?”

“No,” said the stranger; “I did not say so. An apprentice of a few months standing might manage to put a shoe together; but this is only a small part of the ‘art and mystery.’ A man may be a tolerably good shoemaker, who would be quite unable to make a boot—at least, as it ought to be made. Then, a workman frequently excels in one particular department in the trade, who is almost a novice in other departments, and never undertakes them. And, in the last place, a shoemaker may be able to put well together the leather that is given into his hands, who is incompetent to take the measure of a foot, or to cut out the leather so as to produce a good fit. To be sure, there are a great many shoemakers who perform every part of their trade themselves, or with very little assistance, and who please their customers with their work; but it is not without much trouble that they have attained to such proficiency; and even they, if they had a choice, would generally prefer being confined to one or two branches of the trade. For instance—you may fancy that a workman, whose hands and fingers have been employed for two or three days upon a farmer’s top boot, or a countryman’s heavy nailed shoe, must feel rather awkward in setting about a lady’s thin dress slipper.”

After this, the gentleman told Edward several interesting things about the history of shoemaking, and the different sorts of shoes worn in different countries.

He said that shoemaking must be an old trade,

as shoes are spoken of by almost all the ancient writers whose works have been preserved. "Mention is frequently made of them in the Bible," he said; "for instance, Moses, when he approached the burning bush on Mount Horeb, was commanded by God to put off the shoes from his feet, because the ground on which he stood was holy."

"I have read," said Edward, "that, in the East, people always take off their shoes when they go into their temples, or any place that they consider holy."

"Yes," answered his uncle, "taking off the shoes, with them, is an act of respect or veneration, as taking off the hat is with us."

"Were shoes made of leather at first?" Edward asked.

"Probably not," answered the gentleman. "Most likely different substances were used for this purpose, according to the nature of the climate; the facilities of procuring them; the extent of skill possessed; or the purposes for which the feet coverings were required. The first form in which shoes were worn, was that of sandals; which were merely soles fastened to the feet and ancles, by strings, probably of the fibres of bark, the intestines of animals, or of strips of raw hide. These sandals were made of different materials, such as the bark of trees, plaited rushes, wood, and frequently of leather. The Jews wore this kind of shoe; and they still are worn among the eastern nations. It was probably to this kind of shoe that John the Baptist alludes, when---speaking of Jesus---he said, 'One mightier than I cometh, the latchet of whose shoes I am not worthy to unloose.' It was the office of menial servants to untie the strings of their masters' sandals; and

thus the prophet confessed himself to be unworthy for this office. Christians are the servants of Christ ; but they feel themselves to be unworthy servants. How great, then, is the honour bestowed upon them when they are called—not servants, but brethren !

“ Sandals are used by the Japanese, who make them of the straw of rice ; and as these soon wear out, when they take a journey they are in the habit of carrying a pair or two of new ones with them, to replace the old. The shoes of the ancient Greeks and Romans also were of a similar shape, made of wood or leather. But this was the first and most simple form of shoes. It was soon found convenient, particularly in travelling, for the whole foot to be covered ; and for this purpose the skins of animals would be likely to present themselves as the most suitable article to be used.”

“ I have read,” said Edward, “ that the Indians wear a sort of shoes made of deer skins.”

“ Yes, they are called mocassins ; but the manufacture is rude ; and the skins being only partially prepared, they are not very durable. A very similar kind of shoes were, not long since, and perhaps are now, worn on the Highlan's, and in the western islands of Scotland, and I believe in Ireland too ; they are called brogues.”

“ Were shoes ever made of iron and brass ?” Edward asked. “ There is a text in the Bible which says, ‘ Thy shoes shall be iron and brass.’ ”

“ The language is supposed to be figurative,” his uncle answered ; “ it occurs among the blessings prophesied to the tribes of Israel, by Moses, just before his death. Some commentators think that it refers to the rich mines of the land of Canaan, particularly that part of it which fell to the

lot of the tribe of Asher—to whom the promise was given,” Deut. xxxiii. 25.

“I suppose they may be right,” said his friend; “but I confess I prefer the common acceptance of the words, particularly as I think no violence is done to Scripture by it. We know that the Jewish soldiers—if they did not wear shoes altogether made of these metals—had their shoes strengthened, and their feet protected by them; and, possibly, the soles of their shoes were studded with spikes or nails, to enable them to pass over mountains and rough places with greater ease. And thus, it may be understood that the blessing promised was that of being enabled to overcome all difficulties that might lie in their way. And it is encouraging to the Christian to know that this promise extends to every follower of the blessed Saviour. It has often supported me under great difficulties and temptations, to think that though the way may be rough, I hope I am ‘shod with the preparation of the gospel of peace,’ Eph. vi. 15; and that as my day is, so my strength shall be.”

Here the conversation, that had been continued with little interruption for more than two hours, was broken off by the approach of the steam-boat to a pier, at which several of the passengers landed, among whom was the companion of Edward and his uncle. As soon as he was out of sight, Edward asked his uncle who he was.

“His name is Mr. ——” answered his uncle; “and he is one of the largest shoemakers in this part of England.”

“A shoemaker!” exclaimed Edward; “Well, I should not have thought it. I thought he was a gentleman.”

“He is a Christian,” replied his uncle.



THE TAILOR.

THOMAS WHITE was about fourteen years old when he was bound apprentice to Mr. Somers, the tailor. He was a sturdy active boy, and had been well trained at home to be useful and industrious.

Mr. Somers' business-premises consisted of a front shop, in which he received his customers, and which he also used as a cutting-room. For this purpose it was provided with a broad board or counter, as well as with shelves for holding his cloths and other goods. Behind this was a small parlour, which was principally used as a counting-house and measuring-room; then a detached building at the back of the house was used as a work-room for the apprentices, and the journeymen who did not take their work to their own houses or lodgings. The keeping each of these rooms in proper order was the business of the young apprentice.

Let us describe the first day Thomas spent in his

new situation. He gets up early and cleans the shop and cutting-room before breakfast. After breakfast, he finds plenty of work upon his hands: the garments, either new or repaired, that were finished yesterday, have to-day to be taken to their respective owners; and here he receives his first lesson in what properly belongs to the trade he is to learn. He is taught by his master how to handle a clothes-brush, and fold a coat; these are small matters; but Mr. Somers tells him that it is by attention to little things that excellence is acquired in greater matters, not only in tailoring, but in almost every thing else under the sun.

Perhaps an hour or two is spent in waiting upon his master's customers with the finished work; and now Thomas is ready for what next comes to hand. Some of the journeymen work at their own houses, and it is not unlikely that Mr. Somers may have occasion to send to one or other of them for the work they have in hand, or with a fresh job, or to give some additional direction that may have been rendered necessary by the whim of the customer; this falls upon Thomas, and the necessity of clearly understanding and remembering, and of carefully delivering the messages with which he is intrusted, is impressed upon his mind.

Returned from the execution of these commissions, our young apprentice has a little time to look about him. His master is at the cutting-board, and may like that he should stand by, to hand him one article after another, as he may want them, and to reach and replace the patterns as they are required, or done with. This is a good opportunity for Thomas to obtain a little insight into the most difficult part of the business—the art of cutting out. These are early days certainly; but if he can

secure only one idea respecting his trade, why he has so much the less to learn. A habit of careful observation is always useful ; and the lad who does not exercise it on the first day of his apprenticeship, is not so likely to make a good tradesman at the end of it as the lad who does.

While thus waiting upon his master in the cutting-room, it is likely that there may be occasion to send to the woollen-draper's, or the trimming-seller's shop to procure silk, buttons, thread, twist, facings, linings, or other articles of the same description that all come under the title of "Tailors' Trimmings." Perhaps a piece of cloth may require to be matched in colour with one or other of these things. Here will be another lesson for Thomas. Most likely he will make a few mistakes at first ; he may bring a black for blue, or green for brown ; but he will soon acquire an aptitude at distinguishing colours and qualities that he will never afterwards lose.

Presently—his master having no further occasion for Thomas's assistance in the cutting shop—he is sent, or taken into the workshop, where are two or three journeymen and the elder apprentices, busily plying their needles. He is not, however, to be immediately placed upon the work-board ; but is told to render any assistance to the workmen that they may require of him ; and, at the same time, they receive a charge to treat him with kindness and consideration, and to instruct him in the best method of performing his duties. As Thomas is a willing boy, and Mr. Somers is particular in the character of the men whom he employs on his own premises, there is but little doubt that they will go on comfortably together.

The help he is able to give in the workshop

will not, at first, be very considerable. It perhaps amounts to only conveying the various irons, which are required in almost every stage of the making up of every garment, to and from the fire, at which they are heated, and keeping them clean and ready for use.

At night, the workmen and apprentices having left their board, it devolves upon the new apprentice to close the workshop, and see that all is secure—the fire put out—the irons quenched, and so on. Then the front shop is to be closed; and thus ends Thomas's first day. It has been a rather long one, and he is pretty well tired. He soon goes to bed, perhaps to dream of hot irons and sharp needles; but most likely to sleep soundly, without being disturbed by any kind of dreams, until the next morning brings with it a similar round of duties. Upon the whole, he thinks he likes his trade; but he wonders when he shall take his seat on the board, and be a tailor in real earnest. All in good time, Thomas; you must remember that "Rome was not built in a day."

Perhaps some months pass by without much apparent progress in the young apprentice; that is, he still continues to perform the menial parts of the trade. It is still his duty to sweep the shops and keep them in order, to run about the town with parcels, to carry work or messages to the workmen, or to wait upon his master, or the journeymen, in the shop. But this time is not really lost. At the end of six months, he finds that he knows much more of the trade than he did at the beginning; he can distinguish one shape and pattern of a garment from another; he becomes a very tolerable judge of the various kinds of trimmings, which have daily to pass through his

hands; he can heat the irons to a nicety; he never makes a mistake in the shade or colour of a piece of cloth which may fall to his judgment to match; nay, he can afford a sly smile of superior wisdom, at a customer who can discover no difference between a bottle-green, and an invisible green; and he has got through all the intricacies of back-stitch, and fore-stitch, and side-stitch, and basting-stitch, and all the variety of stitches—that is, he knows which is which theoretically; and all he has to do is to reduce his knowledge to practice. Neither is he quite a novice in this matter; for, occasionally, he has been allowed to try his hand at these operations; and he has been pronounced by his friend, the head journeyman, to have succeeded admirably for an apprentice of so short a standing.

But now Mr. Somers thinks it is time for Thomas to betake himself seriously to the more important department of his trade; and he is, accordingly, formally appointed to a vacant space on the work-board, and the journeyman already mentioned undertakes to give him the needful instructions as he goes on. The first lesson here is not a very easy one; it is that of sitting properly on the board. It is very well known that tailors sit at their work in a cross-legged position; and, to one who has not been used to sit thus, this position is a very uncomfortable one. But there are few practices to which time and habit will not reconcile us; and Thomas will soon find, that there are advantages connected with the posture he is required to adopt, which will fully counterbalance its present inconveniences.

Thomas is not a boy to be easily overcome by difficulties, and is very anxious to get on as

fast as he can in his business ; and, besides, at odd times he has seated himself, tailor fashion, beside his fellow apprentices, in order to accustom himself by degrees to the proper method. But still, when he has to sit for two or three hours together, he finds it somewhat painful ; and his master, knowing that this will be the case, takes care to call him off now and then, and sends him on an errand, that he may stretch his legs and get a breath or two of fresh air. Sometimes when masters are not thus considerate, and boys not equally willing to learn, this sitting cross-legged is a source of contention between them, which sometimes ends in some compulsory measure on the part of the master—such as causing a sleeve-board to be placed across the lad's thighs, with a heavy iron at each end to keep it down. There is no necessity for proceeding to this extremity in the present instance.

Having, then, properly accommodated himself to the board, the next thing for our young apprentice to do, is, to put into practice the knowledge he has previously attained in the art of sewing. Of course, he must be provided with tools. These are very few and simple. He must have a thimble, which is different from the thimbles usually worn by females in their very useful operations, inasmuch as it has an open top, and is of a much thicker make. Needles of different sizes are also indispensably necessary—these, too, are stouter and shorter in proportion than those generally used in ladies' needlework, and have the distinctive name of “betweens” given them ; a piece of beeswax, a yard of linen for a lap-cloth, and a pair of scissors, are all besides that he will require in this stage of his business.

Thus duly furnished, Thomas sets about his first job, which he is determined to turn out of hand in a masterly style; but he finds it not quite so easy as he had imagined—particularly as he feels a little flurried by having two or three pair of eyes, besides his own, fixed upon the two pieces of calico, which it is his present business to sew together. However, he manages the job at last; and receives the praise of his master for its creditable workmanship.

After this first attempt, Thomas makes rapid advances in his business. He is not long confined to the lowest and most easily executed branches of his art; but materials of more expensive fabric, and garments that require more neatness, as well as strength of needlework, are after a little while put into his hand.

It is not necessary to describe particularly all the processes through which Thomas's busy needle had to pass in the course of his apprenticeship. Perhaps some of our young friends would smile only to read the different names of the various kinds of stitchings and sewings which a gentleman's coat undergoes before it is thought fit to be worn; and there is no occasion to excite a smile at the expence of a very useful trade that, for some unknown reason, has always had plenty of ridicule thrown upon it. It is much to be wished that young people would know why they ridicule any trade before they allow themselves to do so; and that they would, at least, settle in their minds that they could do very well without it. This would prevent the laugh against tailors at all events. But this is a slight digression.

Thomas has advantages in his apprenticeship, which it is to be wished were possessed by all young

apprentices to a greater degree than they sometimes are. He has a considerate master, who will not allow him to be over-tasked; but often contrives to vary his employment, so as to prevent a feeling of fatigue or weariness. He is not exposed to the influence of idle or dissolute companions; and has found a kind friend in the principal journeyman, who sees that he is a willing and industrious lad, and is pleased upon all occasions to instruct and assist him. Under these circumstances, Thomas becomes an expert workman, long before the close of his apprenticeship; and is able to add to his poor mother's little comforts by his extra earnings.

But, being an expert workman is not all that is required of a tailor. He must know how to cut out a coat, or any other garment, as well as how to make it; and he must have a quick eye to take in at a glance, every variety of fashion that he may have an opportunity of observing, and a good judgment to adopt these fashions to the wishes and tastes of his customers. It is not every master who is willing to teach his apprentice these essential matters; and they are thus left to be attained by the unassisted tact of the learner. But Mr. Somers is desirous of giving his apprentice every opportunity in his power of completely learning his trade; so, in the last year of his apprenticeship, he takes Thomas—now a young man—from the work-board, in order to initiate him into the mysteries of the cutting-board. As Thomas has not failed, from the first day of his apprenticeship, to turn his attention to this part of the trade, as far as it has been in his power, he soon masters the first difficulties in its practice; and before the close of his apprenticeship, he feels that

he is competent to take his seat on the work-board as a journeyman at full wages ; or to engage himself as a cutter, if such a situation shall fall in his way.

And here we may take leave of Thomas White—an apprentice no longer—hoping that his good abilities and industry and excellent principles will do him good service while he continues a journeyman ; and ensure him moderate success, at least, when he commences business on his own account ; so that “ his hands ” may “ be sufficient for him.” And this is one of the greatest temporal blessings that can possibly be enjoyed in any station of life. A few more lines will finish our account of this trade.

In connexion with any trade, which relates to the clothing of the human body, our thoughts naturally turn to its first introduction ; and this conducts us to the garden of Eden and the first parents of the human family. These considerations ought to make us serious at all times ; and it will do no harm should they make us serious for one minute now. Do not let us forget that the origin of dress was sin ; and that however necessary it may now be for purposes of decency or comfort, it was once unnecessary for either ; and that the most sumptuous apparel reflects only disgrace upon us as sinners in the sight of God, and against his holy law. Such thoughts as these ought to check the feelings of vanity to which we are prone ; and moderate our regard to fashion and fine broad cloth, into sentiments of humility and self-abasement. And though the tailor’s trade is of such present utility that we can by no means dispense with his services, we should be more—infininitely more—anxious for our souls to be clothed in the

righteousness of the Lord Jesus Christ, Isaiah lxi. 10, Rev. vii. 9, than for our bodies to be arrayed in the most becoming or richest dress.

It is probable that, for some time after the fall of our first parents, the skins of beasts were the only, or at least, the main article used for clothing; but it is equally certain that, at an early period in the history of the world, this rude and primitive material was, in a great measure, superseded by manufactured cloths of various descriptions. The peculiar adaptation of wool, as an animal—and flax, as a vegetable substance, was discovered, and they were both applied to this purpose. The art of dyeing soon followed that of weaving, if, indeed, it were not practised before it; and both, to the present day, have held a place of considerable importance in the manufacturing and commercial history of every civilized country; but a description of them is unnecessary here, as these processes are passed through before that of the tailor is put into requisition.

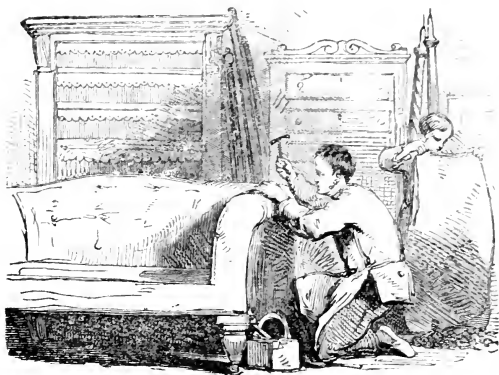
Woollen cloth is the most important material upon which the skill of the English tailor is exercised; though this is occasionally varied by articles of a lighter description, made of linen or cotton. The principal cloth manufactories are in parts of Yorkshire, and in some of the western counties of England; and the variety in quality, colour, and texture of the goods, produced in these districts, is very great.

The tailor, however, has little to do with these matters, at least, so far as their first contrivance is concerned. He is satisfied with putting the last stroke to the material, whatever it may be, and fashioning it to the taste and requirement of its future wearer. He does not often, indeed, go

to the manufacturer for the goods he requires in his trade ; but purchases them from the woollen-draper. If in a tolerably large way of business, he generally keeps a sufficient stock by him to meet its demands ; but frequently, his whole stock in trade, besides his working apparatus, is folded up in a pattern book, with which he is furnished by his draper, from whom he is supplied when his customer has made choice of his pattern.

Woollen garments are essential to comfort in such a climate as ours. Many centuries ago, the dress of ladies as well as of gentlemen, was composed principally of this material ; not in the form of light, elegant, and soft stuffs, such as are now used ; but in that of stout strong broad cloth ; and the art of the tailor was probably as much called into requisition for the one as for the other sex. The hangings of rooms and of beds were also frequently of this material, and gave exercise to the tailor's trade. But now, the dressmaker has superseded him in the former direction, and the upholsterer in the latter. There is still, however, ample scope for his ingenuity, and he need never fear that his trade will become extinct.





THE CABINET-MAKER AND UPHOLSTERER.

Alfred. PAPA, why are the men who make furniture called cabinet-makers?

Mr. Benson. For no better reason, I believe, than that a cabinet is the name of a piece of furniture—a kind of chest of drawers—used principally for holding curiosities, or articles of value. And as a great deal of ingenious workmanship was frequently bestowed upon these cabinets, the name was after a time given to makers of furniture generally.

Alfred. And how long has cabinet-making been a trade by itself?

Mr. B. I cannot tell you. Most likely it rose by degrees, as luxuries and the means of obtaining them increased. There must have been furniture makers ages ago in other countries, when our own was probably an uninhabited island. And when it was inhabited, our ancestors—or rather the ancient Britons—were in a state of

almost complete barbarism ; while other countries revelled in splendour, and, doubtless, had their cabinet-makers, though not called by that name.

Alfred. But I mean in our country ?

Mr. B. You remember Cowper's "Task," do you not ?

Alfred. Oh yes, papa ; I do, and the first part of it is called "The Sofa."

Mr. B. Well, then, he gives a very good description of the several stages through which the art of constructing such a convenient piece of furniture was likely to pass, before it attained its present perfection. And the same may be said of every other ; and indeed, the same ideas may be applied to the trade itself. It will do us no harm to get the volume, and hear what the poet says about it.

Alfred reaches Cowper's Poems from the book-case, and his father takes it and reads,—

" ————— succeeded next

The birthday of invention ; weak at first,
Dull in design, and clumsy to perform.
Joint-stools were then created ; on three legs
Upborne they stood. Three legs upholding firm
A massy slab, in fashion square or round.
On such a stool immortal Alfred sat,
And sway'd the sceptre of his infant realms.

* * * * *

" At length a generation, more refined,
Improved the simple plan ; made three legs four,
Gave them a twisted form vermicular,
And o'er the seat, with plenteous wadding stuff'd,
Induced a splendid cover, green and blue,
Yellow and red, of tap'stry richly wrought,
And woven close, or needlework sublime.

* * * * *

" Now came the cane from India, smooth and bright,
With nature's varnish, sever'd into stripes,
That interlaced each other ; these supplied,
Of texture firm a lattice-work, that braced

The new machine, and it became a chair.
 But restless was the chair ; the back erect
 Distress'd the weary loins, that felt no ease ;
 The slippery seat betrayed the sliding part
 That press'd it, and the feet hung dangling down,
 Anxious, in vain, to find the distant floor.
 These for the rich ; the rest, whom fate had plac'd
 In modest mediocrity, content
 With base materials, sat on well tann'd hides,
 Obdurate and unyielding, glassy smooth,
 With here and there a tuft of crimson yarn,
 Or scarlet crewel, in the cushion fix'd,
 If cushion might be called what harder seem'd
 Than the firm oak of which the frame was form'd.
 No want of timber then was felt or fear'd
 In Albion's happy isle. The lumber stood
 Ponderous and fix'd by its own massy weight.
 But elbows still were wanting ; these, some say,
 An alderman of Cripplegate contrived :
 And some ascribe th' invention to a priest,
 Burly and big, and studious of his ease.
 But, rude at first, and not with easy slope
 Receding wide, they press'd against the ribs,
 And bruised the side ; and, elevated high,
 Taught the raised shoulders to invade the ears.
 Long time elapsed or ere our rugged sires
 Complain'd, though incommodiously pent in,
 And ill at ease behind. The ladies first
 'Gan murmur, as became the softer sex.
 Ingenious fancy, never better pleased
 Than when employ'd t' accommodate the fair,
 Heard the sweet moan with pity, and devised
 The soft settee ; one elbow at each end,
 And in the midst an elbow it received,
 United, yet divided, twain at once.

* * * *

“ But relaxation of the languid frame,
 By soft recumbency of outstretch'd limbs,
 Was bliss reserved for happier days. So slow
 The growth of what is excellent ; so hard
 To obtain perfection in this nether world.
 Thus, first, *necessity* invented stools ;
Convenience next suggested elbow chairs :
 And *luxury*, the accomplished sofa, last.”

Alfred. But is it true, papa, about the alderman or the priest, and the ladies complaining about hard chairs?

Mr. B. I really cannot vouch for the accuracy of these statements. I dare say that others beside aldermen and priests felt the inconvenience; and as to the ladies' complaints—I know some gentlemen—young gentlemen too—who can appreciate the luxury of a sofa to the full as well as any lady.

Alfred here silently shifted from the sofa to a chair. To tell the truth, he was a little addicted to lolling on the sofa when he had nothing particular to do; though, upon the whole, he was a very active, industrious boy.

Mr. B. We must allow something for the playful fancy of the poet; but still, his description of the advance from primitive rudeness, in the form of a single piece of household furniture, to convenience, and then to luxury, is good and correct; and, as I said before, the same kind of progress may be traced in everything connected with this trade, as indeed with almost every other. The furniture of this room, for instance, though not very costly, probably exceeds, by far, the magnificence of many of the earlier British and Saxon kings.

Alfred. I would rather be a plain English tradesman now, than a king of those times.

Mr. B. An English tradesman of the present day doubtless enjoys many more conveniences than did monarchs then; but there is a better reason than that.

Alfred. What can be a better reason, papa?

Mr. B. Generally speaking they led very unquiet lives; they held their possessions with an

insecure hand; and many of them died a violent death. But more than this, they possessed but little, if any, of the light of Divine Truth, and had no firm and steadfast hope of a life beyond the grave, to cheer them amidst the uncertainties of this.—But we are rambling away from cabinet-making; let us return. If you will get from the book-case a small volume, entitled, “The Middle Ages of England,” you may see what was the character of household furniture some five or six centuries ago. Look for the chapter on “Manners and Customs,” near the end of the volume.

Alfred. I have found it, papa. Shall I read?

Mr. B. Yes.

Alfred. “The furniture was even more rude than the dwellings, during the middle ages of England. The tables were generally heavy planks laid upon tressels; benches and stools served for seats; the beds were usually stuffed with straw or chaff. In some cases there were testers and drapery, and even curtains sliding upon rings. The bed-clothes were rough and coarse; but in a wealthy family, the drapery and the coverlids of the principal beds were made of expensive materials, or richly worked. In these houses the furniture of the principal apartments was more costly and massive. The walls of the chambers were rough and unfinished; but in the chief rooms they were covered with hangings of tapestry, often very splendid.”

Mr. B. Ah; these are matters that we can manage to do very well without. We have more comfort in a snug papered room like this, than they had in their rough walled chambers, where the tapestry waved with every breeze. But read the inventory of the dyer’s furniture that follows

Never mind the prices the several articles were valued at, as that particular does not apply to our present conversation.

Alfred. "Roger the dyer had, on Michaelmas-day last—one silver buckle, one cup of mazee (maple), two gowns, two beds, one napkin, one towel, one ewer with a basin, one andiron, one brass pot, one brass skillet, one brass pipkin, one trivet."—But I should think he must have had chairs or stools, and tables?

Mr. B. Perhaps they were planks and tressels, and rough hewn benches, and were not thought worth setting a value upon. At all events this inventory plainly shows how very scantily the houses of the middle classes were furnished in those days. In all probability, this Roger the dyer was not poor, nor in a mean way of business. And if you read a paragraph or two farther on, you will find that this state of things was general.

Alfred. "The scarcity of furniture forms a striking contrast to the inventories of our day; the case was similar in the higher ranks. The Earls of Northumberland and other wealthy nobles, who owned several castles and country residences, usually passed a part of the year at each, in order to consume the produce of their estates; for it then was easier for the proprietor to remove, than for him to bring his corn and cattle to his principal residence, or to obtain money by sending it to market. Yet the furniture possessed by one of these great families did not more than suffice for a single dwelling; when the lord removed, his tables, beds, and plate, and other articles were carted with him. When we remember that roads, in our acceptation of the term, did not then exist, except upon the few lines constructed

by the Romans, we may well conceive that the articles of furniture must have been strongly made to endure such carting; glasses and the elegant fragile articles of a modern lady's boudoir, could not have existed. The figures represented in the tombs of Egypt, show that the furniture and ornamental fittings of houses in that country, more than two thousand years before the period treated of in these pages, far exceeded those used by our ancestors, whose history is now under consideration; they were superior, not only in form, but in quantity and variety."

Mr. B. Very well; then we may fairly conclude that there was but little cabinet-making in those days. The carpenter was the principal furniture-maker then. But after a while, considerable improvements were made in the art, as wealth increased, and there was greater intercourse with the more polished nations of Europe. In the building of houses more attention began to be paid to the comforts of the inhabitants; and this, no doubt, had some effect in improving the style of the furniture within them. If we set down the times referred to in your quotation—which I think we may fairly do—as the era of necessity; and consider the times in which we live to be those of luxury, we may conclude the age of *convenience* to lay somewhere between—perhaps two or three hundred years ago; though, of course, what appear to us now to be merely conveniences, or perhaps necessary comforts, in the way of household furniture, were then looked upon as great luxuries. We have also now many beautiful kinds of wood, some of the most expensive of which is used as a veneer.

Alfred. Veneer; what is that, papa?

Mr. B. Look here at your mamma's work-table ; do you see anything particular in this little chip at the corner ?

Alfred. Yes ; there is a thin piece of wood peeled off, and there seems to be the remains of glue, and the wood underneath is of a lighter colour ; it looks like deal ?

Mr. B. It is deal ; and the thin coat, or peeling, as you term it, is called veneer.

Alfred. How very thin it is ! It does not look thicker than a piece of stiff pasteboard. What fine saws the cabinet-makers must have to cut wood so thin ?

Mr. B. Veneers could not be cut by hand. They are cut by a mill—the saw-mill which you remember I mentioned when we were at Mr. Brown's. I promised then that I would try to show you one some day, and I have not forgotten the promise ; but I may as well just tell you that the saw-mill is a very nicely adjusted piece of machinery worked by steam. It consists of large wheels, some of which are fifty feet in circumference, edged with very fine saws. These wheels are caused, by the action of the steam-engine, to turn round with amazing rapidity ; and the motion is so true and steady that hardly any waste occurs when the log which is to be veneered is properly placed. Very little saw-dust is made, and the veneers can be cut as thin as the sixteenth of an inch.

Alfred. What a clever contrivance. And how nice and smooth the veneer is put on. Can you tell me how they manage this ?

Mr. B. In the first place, the surface to be veneered is made very smooth and level, and then both it and the back of the veneer are worked with

a tool, called a veneering plane, which covers them with minute scratches. This is to make the glue hold the firmer. When this is done, the glue is applied, and the veneer laid on. Great care and attention is necessary to this part of cabinet-making, particularly in preventing any air from getting in between the veneer and the underwood, and in producing a uniformly level surface.

Alfred. And what is it polished with? This work-table shines almost like a looking-glass.

Mr. B. The polish of this work-table is called French-polish; and is a kind of varnish, not so much rubbed in as laid on. It is made principally of shell-lac, dissolved in spirits of wine, and one or two other kinds of gums mixed up with them. Three or four coats of this varnish are applied to the furniture to be polished, each coat being carefully rubbed before the next is applied. It is tedious work, and requires practice to perform successfully. I believe many workmen earn a good living as French-polishers.

Alfred. Now may we just look at mamma's work-box?

Mr. B. That too is veneered with rose-wood.

Alfred. Yes, but there is a sort of edging of light wood around the top.

Mr. B. That is satin-wood; and the narrow edging or border is called banding. It is put on as a veneer. There are three kinds of banding used. When it runs with the grain of the wood, it is called straight banding; when it is cut across the grain, it is called cross banding; and when it is cut at an angle between the two, it is called feather-edged banding. This, you see, is cross banding. Before we leave this useful article, the work-box, we will just peep into it. I think your

mamma would have no objection if she were here. The wood that is used in the interior work is cedar ; not the cedar of which pencils are made, but a wood very similar to it, except that it has no smell. This wood is very much used by cabinet-makers for different purposes ; but I wish you particularly to notice how very neatly every part of the work is put together. You see that each of the divisions is let into a small groove and fastened with glue. You observe how precisely one part is made to fit into another, so that without the aid of a single nail or brad, the whole is as firm as though it were cut out of a single piece of wood. Indeed, the excellence of cabinet-work consists very much in the accuracy of joining. It would not do for the workman to fasten his work with nails ; when anything more than joint and glue is required, he uses screws or wooden pegs : not that nails are altogether excluded from his list of necessary assistances in his work ; but to a great extent they are. The lid, you see, is lined with velvet ; this is fastened with glue, and work of that nature requires very clean and delicate handling. A speck of glue on the surface, or the mark of a dirty finger, would sometimes waste many shillings' worth of material.

Alfred. I should like the business all the better for the care that is necessary. It would be a greater pleasure to look at the work when completed, than if it were what anybody could do. How very nicely this brass ornament is let into the top of the box.

Mr. B. That is called inlaying. This art is very ancient in furniture making. It was practised in Asia, and imitated by the ancient Romans, and was handed down by them. Different materials are used in this art—metals of various kinds,

fancy woods, and shells. The brass work used by cabinet-makers, either for ornament or utility, is bought of the furnishing ironmonger.

Alfred. And now, papa, will you tell me a little about upholstery?

Mr. B. Well, look about the room, and tell me if you can see any upholstery work.

Alfred. Yes, papa; the window-curtains and sofa-cover; and, I suppose, the carpet on the floor.

Mr. B. As far as finishing and fitting up the materials of which these different articles are made, goes, they all are connected with the upholstery trade; but of course you are aware that the materials themselves are manufactured goods, which are procured for the upholsterer's use from different parts of the country. For instance, the window-curtains are made of moreen, which was probably manufactured in Scotland; the sofa-cover is printed calico from Manchester; and the carpet, being of the description called Kidderminster, was either manufactured in that town or in Scotland, where there are large manufactories of carpeting of this description. In fact, the province of the upholsterer is that of adapting the different materials, already made to his hand, to the various offices for which they were originally designed; much as a tailor measures us, and cuts out, and makes up the cloth of which our garments are composed.

Alfred. Then an upholsterer is a sort of tailor to a house?

Mr. B. Why, yes; he clothes our floors, and windows, and bedsteads, with suitable apparel; and thus contributes—not indeed to the comfort of the inanimate wearers—but to our own. And here

it will not be amiss just to glance at the condition of our ancestors in this particular, that we may see how greatly our conveniences exceed what were theirs. Even as late as the reign of Queen Elizabeth, carpets were an unusual luxury; the common covering for floors being rushes, occasionally renewed when a sufficient quantity of filth had gathered on, or mixed up with, each successive strewing. Instead of the elastic mattresses and soft feather beds on which we now rest at night, and which are now furnished by the modern upholsterer,—if we had lived a few centuries ago, we must have been content with a bag of straw, and, perhaps, a log of wood for a pillow.

Alfred. I think, papa, that would have been a very hard case, at all events; and I am glad that we did not live then.

Mr. B. You must remember, that in this hard case, as you call it, you would have had no knowledge or experience of modern luxuries, and would not therefore have missed them. I dare say you would have slept as soundly on straw, as you now do on feathers. It is not every one in the present day that sleeps on a softer material than straw, and yet “the sleep of a labouring man is sweet.”

Alfred. I should think, from what we read about tapestry and hangings just now, that upholstery is an older trade in this country than cabinet-making.

Mr. B. Much attention was certainly paid to these articles in the dwellings of the rich at a very early period in our history; but I fancy they gave but little scope to the ingenuity of the tradesman. The fact is, the rude construction of the dwellings rendered such appliances necessary for comfort; and, by those who could afford it, considerable expense was lavished in their purchase, and much time

employed in ornamenting them with needle-work ; but this was the business of the ladies of the household ; and when tapestry was finished, it was clumsily attached to the walls, without much regard to neatness, much less to taste.

Alfred. I have read that at one time tapestry work was the principal employment of ladies.

Mr. B. Yes, I believe their time was divided between that and household occupations, with some occasional intervals of recreation ; and, to give them their due, they must have laboured hard in this vocation. Specimens of their industry still remain, that must have taken the best years of a tolerably long life to accomplish with a single pair of hands ; and I have heard of one, so magnificent in design and minute in detail, as to have been handed through three generations of busy housewives before the finishing stroke was put to it. I am inclined to think that the ladies of the present day are better employed than in such laborious trifling ; while the department which they have abandoned has passed—as far as has been found necessary—into the hands of a very useful body of our countrywomen, the upholstery workers, who thus obtain a respectable livelihood.

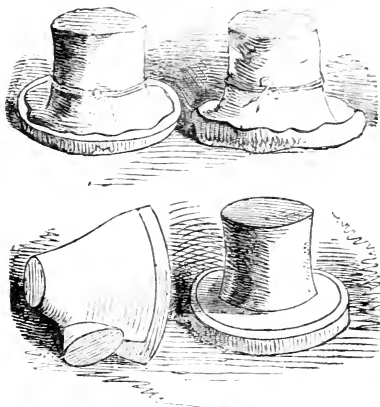
I may just mention that tent-making was formerly a kind of upholstery. In the military history of our own and other countries, we find that the tents of monarchs and distinguished generals and officers were often made of very rich and expensive materials ; such as cloth of gold and silver, silk, and embroidered tapestry ; and were fitted up in the interior with corresponding splendour : and a single tent was a valuable prize when it fell into the hands of an enemy.

Alfred. Perhaps, then, the apostle Paul made

these kind of tents; he was a tent-maker by trade.

Mr. B. Yes, he was; and some commentators speak of him as an upholsterer. But it is a matter of little consequence to us whether he worked upon silk and tapestry, or canvas and leather, of which the tents of soldiers and shepherds were commonly made. It is enough for us to know that though he was an apostle, he was not above working with his own hands as the means of providing “things honest in the sight of all men;” and that, though he might reasonably have required the support of the churches, among which he laboured in preaching the gospel, he chose rather to show his entire disinterestedness and consecration to their service and that of his Lord and Saviour; so that, instead of being burdensome to them as the apostle of Christ, he was willing to have imparted to them, “not the gospel of God only,” but his own soul also, together with the labour of his hands, because they were dear unto him, 1 Thess. ii. 6—8. Let us, my dear boy, be willing to do the same for the cause of Christ; and let us never forget that no trade or calling is really dishonourable when we honour God, and benefit our fellow-creatures in attending to its duties.





HATS IN VARIOUS STATES OF PROCESS.

THE HATTER.

Now get your hat, and and let us examine it. Is it a silk hat? No; that is well. It will answer our purpose, then, in endeavouring to describe how beaver hats are made.

To furnish this one article, how many parts of the globe have been ransacked? How many thousands of miles have been traversed? How many hands have been employed? How long has it taken from first to last, to get together and put together the various materials of which it is composed? These are questions that are easier asked than answered. But we will try to furnish some little information which will, at least, enable you to carry out the calculation to some extent, if you feel so disposed.

And, first, let us see how many different sorts of

things have to be brought together before a hat such as this can be made. There are the fur, with which it is covered—the wool, of which the body, as it is called, is partly composed—the cambric and silk and leather with which it is lined—the silk cord, and buckle and band, and cloth, with which it is trimmed—beside the several ingredients that are necessary in the processes through which it has to pass, in the course of its manufacture, and the tools that are employed upon it.

Well, we will begin with the fur ; or the smooth, glossy, hairy surface of the hat.

Your hat is called a beaver hat ; but the fur of other animals is used in all beaver hats. It is very likely that, at least, five different animals have yielded their portion of fur in the manufacture of this single hat.

The beaver stands first on the list. You have heard wonderful stories of this animal ; and perhaps you may have seen one. They are occasionally to be met with in menageries. There are, or were, a short time since, two in the Zoological Gardens in Regent's Park. We must not take up room in this book by describing this interesting animal ; or in entering into its history and doings. It is only necessary to say that it is found principally in the northern parts of the American continent—three or four thousand miles from England. There are other parts of the world of which the beaver also is a native—Africa, for instance ; and some parts of Europe, on the banks of rivers ; and it is supposed to have been an inhabitant of our own country some hundreds of years ago : but it is from the North American continent, that the hat-makers are principally supplied with beaver skins.

A good beaver skin is very valuable as an article

of commerce; and this leads men to hunt these animals; and, as the fur is in the best condition in winter, the hunting is principally carried on in that season. Many thousands of skins are annually brought to this country for the sole purpose of furnishing one single material in the manufacture of hats.

Another animal, whose fur is also used for this purpose, is the mus-quash. This, too, lives in North America; it is very much smaller than the beaver; and resembles a water rat in shape, but not in size; it being about as large as a small rabbit. Like the beaver, it lives on the borders of streams, or in swampy marshes; and constructs houses, but of a less durable character. Hundreds of thousands of mus-quash skins are annually brought to England, for the sake of the fur used in the manufacture of hats.

A third animal whose fur is also in request for this purpose, is the coypu. It is found in some parts of South America; and is, like the beaver and mus-quash, aquatic in its habits, and lives in burrows which it digs out in the banks of rivers. It is very similar in shape to the mus-quash, but considerably larger in size. The skins of these animals are imported to this country for the use of hat-manufacturers, under the name of Neutria skins.

And now we come to the more familiar hare and rabbit, whose coats are also put into requisition in this manufacture. It would be impossible to calculate, and very uncertain to guess, the number of skins of these two well known animals, that are annually collected through the country, and pass through various channels, into the warehouses of the hat-maker: but, without fear of exaggeration, they may be reckoned by millions.

The wool used in hat-making, is principally that of lambs; and much of this is brought from other countries.

The other materials used, being already manufactured goods, may be passed over with a short notice. For instance, the cambric part of the lining is made of cotton, brought probably from America or India; the silk lining and binding and cord may, very likely, have been spun by the industrious silk-worm of China; the leather lining is perhaps entirely of home growth and manufacture; the steel buckle we may take for granted was made at Birmingham or Sheffield, but the iron of which it is made, was possibly dug out of the mines of Sweden or Russia.

And now, having got together all these materials, and placed them in the hands of the hat-manufacturer, let us see how he proceeds.

The first thing necessary is to cleanse the wool and skins from the dirt and grease which is plentifully mixed up with them. This is effected by the application of hot-water and soap; the process being carried on in a part of the manufactory fitted up for this purpose, with boilers and other necessary utensils. After being well washed and dried—the wool is carded, or combed; and the skins are pulled, or stripped of the outer coat of hair.

If you take a hare or rabbit-skin, and turn back a portion of the fur, you will see that there are two distinct coats of hair that differ very much from each other in quality. That which is uppermost and visible, you will find is long and coarse; while the under coat is shorter, but very fine and soft. It is this part of the fur which is alone of any use to the hat-maker; and it is necessary therefore, to get rid of the outer coat before anything

further can be accomplished. This is done by pulling out these coarse long hairs, and is generally the work of women, who, taking one skin at a time upon their knees or on a bench, tear them away by means of a knife, and the inner part of the thumb, which is guarded from injury by a stout leather fastened upon it.

After the skins are thus stripped of the useless hairs, the fur is cut from them by a machine consisting of rollers, and a sharp iron blade, which is so arranged as to take off the fur without cutting the skin. After this process, the skin itself is useless, to the hat-maker, and is thrown on one side—but not to be wasted or destroyed; there are very few things in the world that are useless to every body; and though these stripped skins are unavailable to the hatter, they are not so to the makers of size (a kind of glue); and are accordingly transferred to them.

But we must return to the fur, which still requires some further attention before it is put to actual service. There is still some mixture of the coarse hairs with the fine, which escaped the operation of pulling; and these have to be separated. To effect this, a singular machine is used, called a blowing engine. This is a long hollow box, into one end of which a quantity of the fur is put; a current of air is then introduced, which blows the fur through the box. But in its passage, the coarse and useless hairs—which are much heavier than the finer fur—drop to the bottom, while the fur is carried to the farthest extremity of the box. You may better understand this curious process, by trying a simple experiment yourself. Take a small feather, and a little piece of fine down, hold them together before your mouth, and then suddenly

blow them away; you will then find that the down being lighter than the feather, will probably fly to the end of the room, while the feather will fall down before it reaches half way across. Perhaps it was some little experiment of this kind which led to the use of the blowing engine. You know that it was the accidental fall of an apple to the ground, which led Sir Isaac Newton to the discovery of one of the first laws of nature—gravitation.

The material being thus prepared, we pass on to the actual business of hat-making.

Now, let us try another easy experiment. Take a single filament of wool—or a single hair from your own head will answer the purpose—examine it—it seems quite smooth from the point to the root. Hold it tightly at the root by the finger and thumb of one hand, and draw it gently between the finger and thumb of the other hand, and you still say that it is smooth—smooth as a hair. But now, hold it by the point, and draw it between your finger and thumb from the point to the root—Do you find any difference? Yes, there is a little roughness—it does not slip along so easily. Now place it on the palm of your hand, and rub it backwards and forwards with the tip of your finger; once—twice—thrice—there, it is almost gone; it has gradually worked its way from the root to the point with the slight friction you have given it. Now this proves that the hair is not smooth; and if you have access to a microscope, and examine it by that, you will find that its surface is covered with very small teeth, which point, all of them, in the direction of the point of the hair; and you will now understand that when your finger was moved over it in that direction, it slipped over these teeth without meeting any

resistance from them ; but when it was moved in a contrary direction, it did meet with resistance sufficient to cause the hair itself to be drawn with it in its progress. This very interesting circumstance is of great practical importance to the hat-maker ; for when a quantity of fibres such as these are brought into close contact with each other, and pressed and rubbed together, the quality that they possess of moving towards the roots, causes them to twist and interlace with each other, till they become entangled in one compact mass, each individual fibre being held firmly in its position by the minute projections, or teeth, which we have referred to. This operation is called felting.

There is a story which attributes the discovery of this—natural weaving, we may call it—to Clement, the fourth Bishop of Rome. It is said that he was fleeing on foot from his persecutors ; and finding his feet blistered and sore by continual travel, he put some wool between his sandals and the soles of his feet, to relieve his pain ; and that the pressure of his feet, together with the warmth and motion given to the wool, forced it into the compact and uniform substance that is now known as felt. It is further said, that he afterwards improved upon his first discovery, and introduced the manufacture of the substance. How far this legend of the church is founded on fact, it is impossible to say ; but the probability certainly is, that this, like the discovery of the law of gravitation by Sir Isaac Newton, and many other very important principles in science and art, may have its source in what is usually termed accident ; but accident only, as opposed to human forethought or design.

But we have now to see how the hat-maker sets about this felting operation ; and it is necessary

here to observe, that the "body" of the hat and the beaver covering are, in the first stage of the manufactory, produced separately. Let us take the "body" first.

This is made of a mixture of wool and rabbits' fur, in different proportions according to the intended quality of the hat. Of this mixture, a sufficient quantity for one hat is weighed out, and given to a workman, whose business it is to give it the final preparation for felting. This workman is called a "bower," on account of the peculiar instrument which he uses. This instrument is a bow, something like the bow of a violin in shape, though differing from it very much in size and workmanship. It is a strong staff from five to seven feet in length, having a bridge at each end; and a strong cord, made of cat-gut, is stretched from one bridge to the other. In using this bow, it is suspended in the middle by a string reaching from the ceiling, over a bench on which is placed the material to be "bowed." The "bower" then takes the staff in his left hand, and, in his right, holds a small stick with a knob at each end: this is called a "bow-pin." He then places the bow in such a position, that the string is near the edge of the material, and plucks the string with the bow-pin. The string, as soon as it is released, flies back nearer to the bow-staff than its original position, strikes into the wool, and again returning to its place of rest scatters a part before it, to a distance proportioned to the force with which it was pulled. This is repeated again and again, until the whole heap of wool and fur is completely separated, fibre from fibre, and disposed in layers in every possible direction. The workman requires great skill and practice to perform it successfully. Having been suffi-

ciently "bowed," the mixture of wool and fur is next divided into two portions, and the felting is commenced. First, each of these portions is separately pressed by the hands, assisted by a light framework of wicker, and afterwards by a piece of oil-cloth, into a flat triangular form; and by this pressure, and the motion of the hands backwards and forwards over the covering, the fibres are made to unite in the manner already described, so as to bear careful handling, without being disarranged. These two halves, in this state, are called "batts."

The next thing is to unite them. In doing this, the workman takes a piece of paper of the same shape, but rather smaller in size than one of the batts, and lays it upon it, folding two edges of the batt over the edges of the paper, so as to meet on the upper surface of it. The paper is thus quite enclosed in the batt. A little gentle rubbing soon causes the edges to stick together, and then the other batt is laid over the first in the same way, only that the edges meet on the opposite side: these are also made to unite like the former. You see now the first form of a hat. It is a flat three-corned curious looking substance; as unlike a finished beaver, in colour, shape and consistence, as can well be imagined. But have patience, and one step after another will bring it nearer and nearer to its final shape and quality.

The hat, thus far formed, is now wrapped in a damp cloth, which is closely folded over it, so as to preserve the triangular shape, and is worked by hand; the workman rolling and unrolling it, pressing and rubbing it in every direction, in order that the fibres may still more closely unite, not only in each separate batt, but also that the two batts may be firmly fastened together, or incorporated with

each other by the process of felting. When this is completed to the satisfaction of the workman, he unfolds the cloth, takes out the batts, and slips out the paper at the edge that was left open. And now we see what the paper was for: if it had not been there the whole of the substance would have been felted; and where then would have been the inside of the future hat? But the paper prevented this, and now we have a kind of three-cornered cap without a brim—by no means elegant indeed, to look at, or comfortable to wear; but we begin to believe that something may be made of it, though much still remains to be done.

The felting is not yet completed; indeed, it can hardly be said to be more than begun; but perhaps enough has been said to explain the principles; and we must now hurry more rapidly through the remaining process.

The cap, or hood—as it is called—is now taken to what is called the “kettle.” This is a large boiler containing a quantity of hot liquid, into which the cap is dipped from time to time, while the workman still continues to roll and press and rub it until the whole substance is increased considerably in thickness, and shrunk proportionably in size. While this is doing, the workman examines it carefully, to discover if there are any inequalities in its thickness; and where this is the case, he rubs a few loose fibres into the thinner parts in order to rectify the imperfection. It is necessary here, too, to preserve a greater degree of thickness in the outer edge of the cap that is intended for the brim of the hat. Thus far, then, the body of the hat is produced. After this the hood is brushed over with a composition by which it is rendered capable of resisting or throwing off water, instead of being

pervious to every shower. As yet, the body of the hat bears but little resemblance to what it will be. Its colour is a kind of dirty drab; its shape when opened like a large funnel—wanting only the spout; and its texture more like that of a stout cloth than the visible part of a finished beaver hat.

Now we must turn to the beaver fur, which is intended for the covering, and which we have not yet traced beyond the blowing engine.

Nearly the same process is repeated with this, as that which we noticed in the first stages of the manufacture of the body. The fur is bowed by a smaller bow, and, if possible, with greater pains and skill. It is then pressed into a light felt, the same in shape as the body or hood; but a little larger. This is called a “roughing.” Then the hood is again dipped into hot liquid to soften it, and the roughing is laid on, and pressed down upon it with a wet brush, and a strip of the same is laid round the inside edge to form the underpart of the brim. Then, by the felting process, the body and the covering are made firmly to adhere to each other, the roots of the beaver fur entering into the body, leaving the points projecting outwards. Here then we have the hat in another stage of its manufacture; but the shape is yet unaltered. Let us now see how that is managed.

First, the workman turns up the portion of the edge intended for the brim; then he draws the point of the hood through the middle of the circumference left—or turns it inside out—so far as to produce another fold the same depth as the former one; then he turns it back again, making another fold; then back again; and so he goes on until the hood has changed its form into a flat round shape, having the point in the centre, and a

number of folds surrounding it, each, of course, larger than the other, as they approach the outside. The workman, then, with his hands, pulls and presses the centre, until he has produced a flat portion sufficient for the crown of the hat, assisting this operation by the plentiful use of hot water. Then, placing the hood upon a wooden block, corresponding in shape to the inside of the hat that is to be, he forces the sides of the one over the sides of the other, by means of a string tied tightly round them. We have now the whole crown of the hat in its proper shape; but the brim curls upwards all around it: but this is soon flattened by wetting and pulling and pressing. It is then dried.

Having now brought the hat to nearly the shape that it is intended it should retain, we must pass very slightly over its remaining progress.

First, the fur, or as we must now call it the "nap," is combed with a kind of brush of fine wires, and cut with shears to the requisite length. Then the hat is taken to the dye-house, where, with some dozens of others, that have advanced to the same stage of completion, it is several times dipped into a vat, containing a dye of logwood and other ingredients, which changes the natural colour of the materials to the fine black of the beaver hat. When this is finished, it is again dried; and last of all, it passes into the hands of the finishers, from whom it receives its binding, lining, trimming, and final shaping.

We have thus hastily traced a beaver hat through its various changes, from the natural wool and fur of which it is composed; and the description given will apply to a great extent, to all kinds of hats or bonnets that are made of

felted wool or fur. We must, however, say just a few words about silk hats, which are now much worn.

The bodies of these are sometimes made of felted wool, but not always, woven willow and stiffened cambric being frequently employed instead. But the peculiarity that gives them the name of silk hats, consists in the outer surface, or covering, being made of silk instead of beaver or other fur; and instead of being felted (of which process silk is incapable), it is woven into a fine thin plush, which is sewn to the proper size and shape of the hat, and afterwards fastened to the body with a suitable cement.

Some years ago there was an attempt made to introduce a manufacture of hats, similar in every respect to that of silk hats, except that the outer covering was made of cotton plush; but no great success attended it; the cotton not possessing the glossy quality of silk, nor being capable of receiving so deep and permanent a dye. In other respects, perhaps they were more durable.

Hat-making gives employment to the industrious, and bread to the hungry. Doubtless, we might go back to the coarse cloth caps that were commonly worn in this country three hundred years ago; or we might be contented with hats made of straw or rushes; or we could, without much injury to our heads, dispense with a covering altogether. But our economy would operate injuriously to the manufactures and commerce of our country, and even of the world, so far as they could be affected by the actions of one or two single persons. And if every body who now wears a hat, should from economy, or for some other reason, discontinue its use, how many

thousands of industrious people would be instantly thrown out of work ! It would be the same with any other of the conveniences or luxuries of life of whatever kind ; and “without justifying luxury, or expense beyond the means, too common in every rank, it may be observed, that the person who encourages and employs the honest artificer, is a much greater benefactor to this country, than either the man who hoards his wealth, or distributes it blindly in careless charity.”*

But if we allow that it is right to be industrious and enterprising, and to encourage industry and activity, in such things as these, is it not of far greater importance that we ourselves should exert all our energies in the things that relate to the welfare of our souls ; and that we should strive to induce all around us to do so too ? Our Saviour tells us to “labour *not* for the meat which perisheth, but for that meat which endureth unto everlasting life,” John vi. 27. But of how many who labour hard in this life, and whose labours result in our convenience and comfort, may it be said that they know not, neither do they consider : they are “like the beasts that perish !”

Think of the poor Indian hunter, pursuing the beaver to its winter haunts, or striking the musquash in its house of mud and sticks—of the ignorant China-man rearing his silkworms—of the American or East Indian slave toiling all day in the culture of the cotton tree—of the shepherd in Spain, enslaved in mind, though not in body, tending his flocks—of the wood-cutter in South America, lifting his sharp axe against the logwood tree—of the Russian serf, who spends the greater

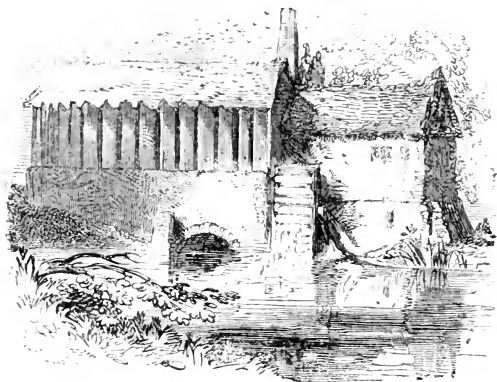
* The Tudors, p. 369.

part of his life in the dark and dismal iron mine ; and ask yourself, how many of these have ever heard of Jesus and his great salvation.

Think again of the sailor who brings home all the commodities we have been speaking about—of the merchant and the trader—of the workmen in the factories—and even of the poor English skin-collector ; and ask yourself, how many of these, amidst all their bustle and activity, give themselves time to think of the things that belong to their eternal happiness ? Who, though they have superior opportunities of knowing the gospel of salvation, yet neglect it ?

But first, young friends, let us ask you a question. Do *you* neglect this salvation ? Do *you* love the Saviour ? Are *you* seeking the kingdom of heaven ? You ought not to neglect these matters for a single hour : it is of infinite importance that you should be set right in them ; and then, think of others ; and think in this way :—

“ There are a great many people in the world, ah, some hundreds, who are working hard every day for my convenience. Now, what can I do for these persons in return ? It is true, money is paid for all that I receive from them, and this satisfies them ; but can I do nothing more for them ?—ought I not to try to furnish them with spiritual blessings in return ? Yes, I certainly ought, and I will try. I will give something that the Bible, and good books and tracts may be circulated at home and abroad ; and that the poor and the ignorant may be taught to read them. I will pray that God will send out his light and his truth, and that the earth may ‘ be filled with the knowledge of the glory of the Lord, as the waters cover the sea.’ ” Hab. ii. 14.



A PAPER MILL.

THE PAPER-MAKER.

ALFRED BENSON lived in the country, and had not the opportunities, which many young people have, of seeing different operations carried on from day to day, excepting farmers' work. But nothing pleased Alfred so well as either to get his father to talk about and describe any of the manufactories he had visited, or the mechanical trades with which he was in some measure acquainted; or, better still, to visit the manufactories or workshops in company with his father.

Mr. Benson took every opportunity in his power, to gratify his son in this particular; and one morning, told Alfred that his business called him to a paper-mill, a few miles distant from their home, and that he might, if he pleased, accompany him.

It may be supposed that Alfred was not unwilling

to take the journey; and that he made all the haste he could to prepare for it. Indeed, he made so much haste, that he was ready and waiting, full half an hour before the gig, which was to convey them to the mill, was brought to the door.

When they arrived at the mill, Alfred's patience was put a little to the test, while his father was engaged in the counting house. All he could do, while this business was going on, was to look out of the window upon the river, which was underneath, and watch the water as it rushed over the flood-gates, and fell roaring, and hissing, and frothing on the other side, forming a water-fall of sufficient power to turn the large wheel which set the whole machinery of the mill in motion.

As soon as Mr. Benson had finished his business with Mr. Snow, he told him that he had brought his son to see the process of paper-making, and asked permission to go over the mill. This was readily given, and Mr. Snow directed his foreman to accompany the visitors, and give them all the information they required.

The first part of the mill into which they were shown contained the heavy machinery that was set in motion by the water-wheel which Alfred had just been contemplating, and that communicated with every other part of the building in which machinery was required. Here they found the millwright busily repairing a large wheel, then out of use, who very readily explained the principle of a water-wheel, and the different sorts that were used, as well as the manner in which one part of the machinery which they saw, acted upon another that was out of sight.

Mr. Benson and Alfred were now conducted into a large room in the upper part of the mill, called

the rag-room. Here they saw a great number of women and children employed in sorting a quantity of rags which lay in large heaps on the floor. Their conductor told them that these rags were sorted into several different kinds; and he showed them a number of boxes, or bins, ranged along one of the walls, each containing a quantity of the sorted material. Alfred looked into these bins, and saw that one contained rags of all colours, except blue, and that another was filled with blue rags alone; that another held coarse canvass and sacking; and others, white and whitey brown rags of a different fineness; and that one appeared to be filled entirely with thin stripes that looked like seams cut off from the rags of which they had formed a part.

On turning again to the women who were sorting the rags, Alfred saw that each of them was provided with a box, which was divided into a number of compartments for the different sorts of rags; and that a knife blade was fixed on the top of the box, for the purpose of dividing the rags, and ripping off the seams, which were, as he had seen, placed by themselves.

Alfred thought this was very dirty work, and so it is; but the women seemed very healthy and cheerful, and to care but little for the dirt and dust with which they were surrounded. He was informed, too, that, before being brought into this room, the rags had been cleansed from much of the dust that they brought with them to the mill, by means of a dusting machine. This he was presently shown; it was a large hollow cylinder,* made of wire, enclosed in a tight box, and made to

* A cylinder is anything that has a circular surface and flat ends. A common round ruler is a cylinder; and so is a garden roller.

turn round very rapidly within the box. The rags are put into this wire machine; and the motion given to it whirls out the dust into the box.

Alfred and his father were next led into another part of the mill, where they were shown a washing machine, into which the rags are put, after being sorted.

The washing-machine which they saw was a large oblong iron-trough, through which a stream of clear water was kept constantly flowing by means of pipes. On one side of this trough, the visitors were shown a roller, set very thick with iron teeth or knives; and under this, they were told by their conductor, was fixed a block or plate, in which were rows of similar teeth, so arranged as that the teeth of the revolving roller should pass very close to them, but so as not quite to touch.

The whole machine was so contrived, that, when the roller was whirling round on its axis, (which their guide informed Alfred it did very rapidly—at least 150 times in a minute,) the rags in the trough were drawn in between the teeth of the roller and the block, and cut or torn into very small pieces, and that they were carried by the current of water round and round the trough, so as to pass through the process again and again.

Alfred was then informed, that the rags, after passing through this process, were boiled in lime-water, and again subjected to the washing-engine, in order to free them from any impurities that might have escaped the first washing, as well as to separate the fibres more perfectly.

The visitors were next shown several large stone vats, in which were a quantity of rags in

another stage of process. Alfred noticed a very strong smell arising from these vats, and was told that it was occasioned by the ingredient which was mixed with the water; and that the rags were undergoing the process of bleaching; that this ingredient was the chloride of lime; and that the application of it to this purpose, was one of the modern discoveries of chemistry, by which the process of bleaching, that formerly would have occupied weeks to complete, might now be performed in a few hours.

Alfred agreed that this was a great advantage; nevertheless, he did not like the smell of the bleaching material; and was not sorry when the foreman invited his father and himself to accompany him to the engine-room, to witness the final conversion of the bleached rags, or "half-stuff," as it was called, into the pulp of which paper is made.

In the engine-room, they saw a number of machines, similar to those employed in washing; the only difference being, as they were told, that the teeth of the roller and block were finer and closer in these engines, and that the roller was capable of turning with still greater rapidity. They noticed too, that the water was not allowed to run through these engines ("beaters" they are called) as it did through the washing-engine. Their guide informed them that the "half-stuff" was usually worked in the beater for about five hours, when it was ready to be made into paper, and in that state was called "prepared stuff;" and he showed them one of the engines in which the process was nearly completed. Alfred could scarcely believe that the beautiful snow-white substance that he saw, had but a few hours before formed part of the mass of dirty rags that the women in the upper room were sorting;

and he was still more surprised, on being told that, not only comparatively fine and white rags, but rags of all colours, coarse sacking, and even old ropes, were capable of being brought into this state ; though, of course, more preparation in washing and bleaching was required in one than in the other. Alfred took a little of the pulp in his hand to examine it—though it seemed almost too delicate to bear the touch—and found that it had lost all similarity to its former condition ; and that nothing like a rough fibre was to be seen. Having lingered in this part of the mill as long as their time would allow, they followed their conductor to a lower story of the building, which contained the paper-making machine.

“ And now for the real paper-making,” exclaimed Alfred, as they stepped into the room in which this operation was busily going forward.

But it was some time, after entering this room, before Alfred could, in the least, understand what was going on. There was a large machine, extending nearly the whole length of the building, consisting of rollers, some very large, and others smaller,—and wheels, and straps, and pumps, all in motion ; the whole resting on an iron frame, and one part communicating with another by means which he could not clearly perceive, and set in motion he did not know how. Alfred looked at his father for the information he required, and was referred by him to the person who had hitherto accompanied them in their progress through the mill ; and who was better able than himself to give it.

In the first place, Alfred was shown two large vats at the head of the engine which contained the pulp as it left the beater ; only that more water

had been added, so as to produce, when completely mixed with the pulp, a milky looking kind of liquid. He saw, too, that these vats communicated with each other by a pipe, and that the pulp contained in them, was kept in constant motion by a kind of open framework, which was made to turn round and round by machinery under the vats. This framework, Alfred was told, was called an agitator; and its use was to prevent the pulp separating from the water and sinking to the bottom.

Moving a few steps onward, Alfred was shown another vat, into which the pulp was admitted from the larger reservoirs he had just left. Here, too, the liquid was kept in motion by another agitator, which his guide told him was called a "hog." Then he observed, that the pulp flowed from this vat through several small holes near the top, into a trough placed in front of it; and that from this trough, on the opposite side to that in which it entered it, the liquid fell over upon a fine wire cloth that moved onwards, conveying the steady stream of pulp which it received along with it. Alfred saw too, that the pulp was prevented from running off the wire cloth, by leather straps fitted close to its sides, and which being placed a little above the level of the surface, formed a ledge: and watching the pulp as it moved on with the wire, he perceived that the watery part of it drained through its meshes, leaving the more solid material behind. "Now," said the man to him, "you shall see how soon this becomes paper. Just make a mark on the stuff that you will know again." Alfred obeyed him, and with the tip of his finger, wrote the letter A. He was then taken to the farther end of the machine,

where a large roller was moving steadily round, and winding on its surface the manufactured paper from the machine. He was told to watch the paper as it was drawn out by the roller; and in less than a minute, he was surprised by seeing the very mark that he himself had made, on a portion of the firm dry paper. This was quickly torn out and given to him: but he could, at first, hardly believe that it could be the same substance that but such a little time before, had been merely a thick liquid, and had yielded and broken at the slight touch of his finger. He was still more surprised when he was shown the ingenious contrivances by which this change had been effected so rapidly. Going back to the wire cloth, a small roller made of wire was pointed out to him, under which the cloth passed close enough to press out the remaining water from the pulp that lay on its surface: farther on, he was shown two larger rollers covered with woollen felt, between which the pulp—or paper, as it may now be called—next passed: still farther on, it was seen to pass between two other rollers made of metal, the top one being heated by steam; and then again between two others, the under one being heated: by this means, Alfred was told the paper was at once pressed and partly dried. Still travelling on, the long sheet of paper was conveyed between two others, and after that, again two other large rollers—all made hot by steam; until, at last, and in a very short space of time, the whole operation being completed, it emerged from the machine, and was wound off, a sheet of perfect paper.

But what a sheet! Alfred, who had never seen a sheet of writing paper larger than foolscap, or of any kind more than three feet in length, and

two in width, could hardly contain his astonishment at being told that every sheet manufactured by this machine, measured nearly half a mile in length. But so it was.

He next witnessed the process of cutting these large sheets or rolls of paper into the sizes required, which was done by a cutting machine, as curious as the one he had just left. Then he was taken to a large room where he saw a great many women examining the paper that had passed through the cutting machine; throwing out the soiled and torn sheets, and counting the perfect into quires—folding them—and making them up into reams. And last of all, he was shown the press in which the paper was finally placed, before its removal into the store-rooms.

Alfred would have been very willing to visit every room again, and to have the whole process explained to him afresh; and particularly to examine the machinery by which such wonderful effects were produced; but he knew it would be unreasonable to ask it; so thanking the guide for his kindness in listening to his questions, and explaining the work of the mill to him so readily, he followed his father to the mill yard, where they mounted the gig, and soon left the mill behind them.

“Papa,” said Alfred, after they had travelled a little way, “can you tell me who first found out the way to make paper from rags?”

Mr. B. No, I cannot indeed. I believe that not only the name of the person; but the time in which the discovery was made, as well as the country in which it was first practised, are not known; though it has been supposed that paper made of cotton was in use in China, long before

the art of turning linen rags to paper had found its way into Europe.

Alfred. And how long since is that?

Mr. B. That likewise is uncertain. I have read that there is a letter preserved in some library in France, written on paper. It was written to one of the kings who died in the year 1270; and it must, therefore, be nearly 600 years old. This is the oldest piece of linen paper that is to be found in Europe. With regard to our own country, the art is not more than 400 years old, if it can even boast of an age so great.

Alfred. I suppose that, at first, they did not set about paper-making so cleverly as they do now?

Mr. B. No, I suppose not. The first practice of any art, is generally rude and clumsy; and the progress of discovery slow. Till within the last half century, the operations of the paper-maker were exceedingly tedious and imperfect, compared with the improvements which have been since introduced. Modern chemistry and mechanism have both done much to bring about these improvements.

Alfred. Yes papa, chemistry—I remember you told me that the new way of bleaching was a discovery in chemistry?

Mr. B. Yes; and then as to mechanism. In the infancy of paper-making, almost all the work was performed by hand. The rags were first required to be rotted by exposure to air and water, for many weeks before they could be used, and were then beaten into pulp with heavy hammers. After this, a long delay was occasioned by the process of bleaching: and then, instead of the beautiful machine you have just seen, every sheet of paper was moulded singly.

Alfred. How was that done, papa?

Mr. B. The operation was simple enough. The pulp was put into a vat, over which stood the paper-maker with a wire mould in his hand, which he dipped into the vat. The water, as is the case with the wire cloth in the machine, ran through the meshes of the wire, leaving the pulp behind, which was turned on to a piece of felt or woollen cloth; and then the workman was ready for another dip.

Alfred. This was slow work compared with the machine.

Mr. B. Yes; but the principle is the same; and the old method is not altogether disused. For many kinds of paper it answers sufficiently well; and for writing paper especially, it is frequently preferred. It is principally in paper for printing that the great superiority of the Fourdrinier-machine is manifested.

Alfred. What machine did you call it papa?

Mr. B. Fourdrinier. This was the name of the person who introduced it into this country.

Alfred. And now papa, can you tell me what was used for writing upon before paper—this sort of paper I mean—was made?

Mr. B. Several substances have been employed for this purpose. But, first of all, can you tell me the origin of the word “paper?”

Alfred. Oh yes, it comes from a Latin word—“papyrus.”

Mr. B. Very true; and that was borrowed from a Greek word; and the word in both languages signified a substance for writing upon. But that does not give us the origin of the name.

Alfred. Then papa, I don't know. Will you tell me?

Mr. B. The papyrus is a reed that grew principally in Egypt; and which was first manufactured by the Egyptians, into a substance for writing upon; and afterwards, both by the Greeks and Romans. This substance was called after the plant; and from this, the modern name of paper is derived.

Alfred. How could paper be made from a reed?

Mr. B. The papyrus, or paper, was made of the inner bark of the stalk, which was pulled off in strips. A number of these were laid together, side by side, and then crossed with another layer; after this, they were moistened with water, and pressed sufficiently to cause them to stick firmly together. Each sheet, thus made, was rubbed and polished, and was then ready for use.

Alfred. Is such paper used now?

Mr. B. Certainly not, where the more modern article can be obtained. But Bruce, the traveller, says that he saw paper in Egypt and Abyssinia, made of this reed, and precisely in the ancient manner.

Alfred. Will you tell me what other things have been used for writing upon?

Mr. B. Perhaps the earliest or most ancient way of writing was by engraving on stone or some other hard substance. We read that the law of God was written on two tables of stone; and that "Holiness to the Lord," was written on a golden plate, and worn on the head of the Jewish high-priest. But probably the most ancient portable materials used for writing upon, were the leaves of palm trees, or the inner bark of trees. Parchment was also very early and extensively used for this purpose; and, on account of its durability, matters of importance were formerly, as they are in our

days, written on this substance in preference to any other. It is more than probable that the Holy Scriptures were thus preserved. Slips of wood, too, were sometimes written upon, and fixed together in a kind of frame; and tablets of wood, or boards covered with wax or sand, were employed when the writing was not intended to be very permanent. It was such a writing table as this, that Zacharias, the father of John the Baptist, called for, when he wished to write the name that his infant son was to be called.

But all these substances, with the exception of papyrus, bear no resemblance, either in material or mode of preparation, to modern paper: the nearest approach to which is, certainly, that made of cotton and other vegetable substances, by the Chinese first, and after them by Europeans.

Alfred. What a good thing it is that the way of making paper from rags was ever found out!

Mr. B. It is indeed, and the advantages that have resulted from the invention of printing could have been but little known, and the art itself would have been but of comparatively little use, if recourse could only have been had to the insufficient supply, and inferior quality, of every description of paper previously known. If the papyrus of the Egyptians were the only kind of paper now attainable, I am inclined to think we should have but a scanty supply of books, notwithstanding the facilities of printing; and, if parchment were the grand medium of intelligence, the supply must necessarily be still more limited, and the expense much greater. It is very likely that the necessity created by the invention of printing, for much larger quantities of paper than had ever before been required, gave rise, though not to the dis-

covery, yet to a great improvement in the art of paper-making as it now exists. But a Christian, my dear Alfred, will look higher than this, and will trace the gracious and wise dispensations of Providence in the fact that the labours of the paper-maker preceded those of the printer just so far as to afford the necessary assistance to render his effectual ; and that, hitherto, both have advanced together, in their course of usefulness.*

Alfred. But, papa, is it altogether a good thing that there should be so many books? You know the gentleman that dined with us last week said that there were too many books ; and that people were getting too wise ; and besides, that bad books were printed and read as well as good ones.

Mr. B. It is very true, Alfred, that in our imperfect world there appear to be very few things, however good in themselves, without a mixture of evil. Yes, there are bad books printed, and sold, and read ; and bad principles are learned from them, and *they* will have much to answer for, who thus poison the streams of knowledge, and turn a blessing into a curse. But, after all, knowledge is a blessing. For "that the soul be without knowledge it is not good," is a declaration of God's word ; and experience every day repeats the truth. Where it is rightly applied, it is a blessing of unspeakable value ; and as ignorant and sinful creatures, we can never be sufficiently thankful for the means of knowledge placed within our reach. Think, my boy, of the single fact, that it is owing to the joint labours of the paper-maker and printer, that a printed Bible is now obtainable

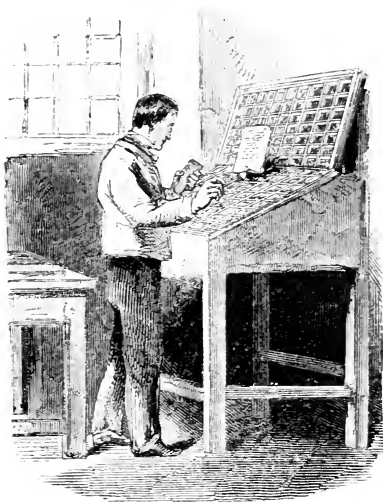
* "The first paper-mill in England was at Hertford, and is supposed to have been erected about the time printing was introduced."—*Middle Ages of England*.

by a working man's one day's labour, while in former times, the whole produce of the toil of years would not have purchased one; and then, if we believe that the gospel of Christ is "the power of God unto salvation," and that the reading of that gospel has been made, by the power of the Holy Spirit, instrumental in saving many a soul that would otherwise have been left in darkness and ruin, surely we cannot too highly estimate the means by which such results have been produced.

Alfred. No, indeed, papa, we cannot. And now will you tell me who first discovered the art of printing?

Mr. B. See, here we are at home. We must talk about printing another day. Now get down and open the gate, and call Thomas to take the horse.





COMPOSITOR AT WORK.

THE PRINTER.

“Now Papa,” said Alfred Benson, on the evening of the day on which he had visited the paper-mill; “can you spare a little time to tell me about printing?”

Mr. B. But suppose you were to tell me what you know about it. You have been more than once to the printing office at A—.

Alfred. You know the printing office at A—, is a very small one, and they have only a common press. There were only two men at work, when I was there last.

Mr. B. What were they doing?

Alfred. One of them was standing before a sort of bench or desk—it was more like a desk, though, for it sloped from the wall to the place where the man was standing—and there was a sky-light just over it. On this desk there were two flat cases, divided into a great many square partitions for holding the different letters of the alphabet.

Mr. B. For holding the types you mean. I think too, if you had noticed more particularly, you would have seen that there were two cases above and two below—four in all. Each of the lower cases is intended to contain the small letters of the alphabet; one in roman type, and the other in italic; and the upper cases are intended for the corresponding capital letters, figures, and marks of reference. The small letters, being most in use, are placed the handiest. The man who was employed at this desk is called a compositor; but what was he doing?

Alfred. He held in his left hand a sort of little frame, made of some kind of hard metal I think; he called it a composing stick; and in this he was putting the letters from the different cases, one after another: but he seemed to take them up so fast, and so much at random, that I wondered how he could know what he was doing. He did not look at the types at all; but kept his eye fixed upon a paper stuck up above the cases. I suppose he was copying from this paper.

Mr. B. No doubt he was. The employment of a compositor is a very interesting example of the facility given by constant practice, to what appears to a novice to be exceedingly difficult and tedious. The eyes, the head, and the hands of a compositor

are all at work at the same moment ; while his eyes are occupied in reading off the manuscript he is “setting up” his head is at work in making out the sense of it, in supplying the proper stops or points, and in directing his hand to each letter as it occurs ; and his hand is travelling over the cases in every direction apparently without much assistance from his eye—picking up a letter here and another there, so rapidly, that the looker on is bewildered with the movement.

Alfred. Every time the composing-stick was full, the compositor lifted out the types into a wooden frame that lay handy to him ; and then went on filling again.

Mr. B. This wooden frame is called a galley, and is large enough to hold the types for a page, or even more—well ?

Alfred. And when this was filled, he tied the types round very tightly with a stout string, and removed them to a large table with a top made of very smooth stone ; and this, I remember, he called the imposing stone.

Mr. B. Now I suppose I must describe the remaining process. You know that books are of different sizes ; and that some pages are twice as large, and some four times as large as others ; indeed, they vary considerably more than this, so that the number of pages required to fill one side of a sheet of paper, of course depends upon the size of the future book : but this is of no consequence to my description. When a sufficient number of pages have been set up to form the side of the sheet, they are arranged in proper order on the imposing stone. An iron frame is then put round them, and the space between the pages is filled up with pieces of wood, so as to leave the same dis-

tance between every two pages; and then the whole is fixed firmly in the frame, by means of wedges, which are driven in between the frame and the pieces of wood so firmly, that they can be moved about without any fear of displacing any of the types that compose it. The iron frame is called a "chase;" the wooden slips are called "furniture;" and the whole, when compacted together, is termed a "form."

Then another part of the compositor's employment is that of distributing the types, after they have been used. This is, of course, just the opposite of composing, and is performed still more rapidly.

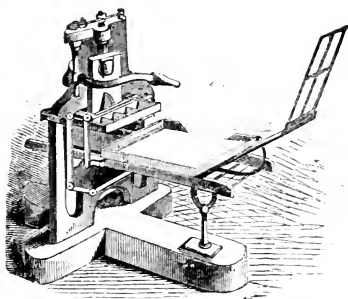
Correcting is another kind of work that belongs to the compositor. With all his skill and practice, mistakes do very often occur in setting up the types; sometimes a wrong letter slips in, sometimes the right letter is placed upside down, sometimes one word is mistaken for another, and very often alterations are made in the sentences, after it has been properly set up according to the first manuscript. To discover these errors, or to give an opportunity for alterations, an impression is taken from the set-up type, in order that it may be read and corrected. This impression is called a "proof," and the required alterations in the types are copied from this proof.

But now we must leave the compositor, and turn to the pressman. What do you remember of his performance?

Alfred. I don't know, papa, how to describe the press at which he was engaged.

Mr. B. I believe I have got a drawing of a printing press somewhere. There, will this help you?

This is an improved iron press, invented by Earl Stanhope, and therefore called a Stanhope press.



But now I think I can help you in your description, if I put pencil marks to a few parts of the engraving, and give you the names of those parts. Here then, I put *a*, that is called the “table”; here I put *b*, and call it the “tympan;” *c*, I mark here, and the name of that part is the “frisket;” *d* and *e* are two handles; and *f* is called the “platen.”

On the table *a* is placed the form of type, with the letters uppermost; which is kept inked with a roller, that lies handy on a sort of tray that holds the ink. Then, after inking the type, the pressman takes a sheet of paper from a heap beside him, and lays it on the tympan *b*, and turns the frisket *c* over it; and then turns them both down upon the form. Then, he gives the handle *d* a turn or two, which brings the table, and all that is upon it, under the platen *f*; and then he gives the handle *e* a tight pull, which presses the platen down upon the form. When he has given this

pull, the handle flies back ; and then he rolls out the table, turns up the frisket and tympan, and takes out the sheet of paper, printed. This he lays on one side, and goes through the same work again and again.

Alfred. I should like to know about the origin of printing. Who was it found out the art, papa, and where did he live?

Mr. B. It is not certainly known. Several cities and towns of Europe claim the honour of being the birthplace of the invention : but perhaps Haarlem has the greatest right to it. It is said that an inhabitant of that city, whose name was Lawrence Coster, used to amuse himself by cutting out letters from the bark of trees, and printing verses and short sentences with them upon paper, for the instruction of his grand-children ; and that this kind and benevolent occupation gave rise to the first idea of printing. It is impossible to say, now, whether this history of its origin is the true one ; but I am sure, we need not wish for a pleasanter one. We can almost fancy we see the good old gentleman, carving out his rude letters with a pen-knife, with a group of admiring grand-children around him—or printing his little scraps with them when cut,—one letter at a time ; and then, all at once, we may suppose the thought entered his head,—“ Why could not a book be made in this way ? ”

Well, whether this is the right story or not, it is known that the first types were made of wood, and very rude and clumsy they must have been ; but they were soon abandoned for metal ones.

Alfred. How long ago was this, papa?

Mr. B. More than four hundred years. In the year 1442, there was a printing-press set up at

Mentz, by John Fust, or John Guttenberg, for he is called by both names, who had been one of Coster's workmen. If I remember right, he was the first who printed a Bible.*

Alfred. I should think that the first printed books must have been thought wonders.

Mr. B. No doubt they were. Still they were very rough and unsightly compared with books of the present day. The paper on which they were printed was coarse; and the printing machinery was in a very imperfect condition. Every printer was his own type-founder, or rather cutter—for cast metal types were not brought into use for some time after the discovery of printing; he made his own ink, too; and probably his own press.

Alfred. Can you tell me what the roller is made of, to take up the ink so neatly? And the ink, too,—it seems much thicker than common writing ink.

Mr. B. The roller is made of hard wood, covered with a composition of glue and treacle. Printer's ink is a mixture of lamp black and oil. It was found, in the first outset of printing, that common ink would not answer the purpose; it blotted the paper and filled up the letters, but this difficulty was soon got over. Well, have you any more questions to ask about printing?

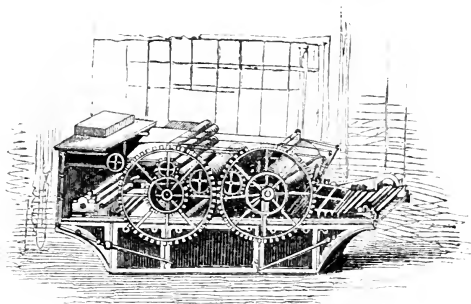
Alfred. The paper that I saw printed upon, seemed wet. Is that necessary?

Mr. B. Yes; it facilitates the work very much, and does not wear the face of the type so much as the hard dry paper would; and it is therefore always damped.

* Caxton was the first English printer. He set up a press in Westminster Abbey, in the year 1471.

Alfred. You said, papa, that you would tell me something about machine printing.

Mr. B. I remember I did ;—or rather, about the results of machine printing. You may form some idea of the machine from the paper-making machine you saw this morning. It consists of a great number of wheels, and cylinders, and



A PRINTING MACHINE.

straps, connected with each other, and all worked, either by hand or by steam. Hand machines are kept in motion by a man, who turns a wheel, something like the cutler's wheel you noticed the last time we were at A—. These machines are so constructed that after the forms of type have been properly placed, and all the apparatus put into order and set in motion, they perform their work with the utmost regularity and dispatch—even to the inking of the type. The only attendance required is, that of two boys ; one to lay on the paper, one sheet at a time, at one part of the machine ; and the other to take it off at another part, printed on both sides. And now for the

results of machine printing. At the best printing presses, it is considered good work for two men to print 250 sheets, on one side only, in an hour; or 250 whole sheets in two hours. With a printing machine, attended by two boys, sixteen sheets may be printed on both sides in one minute. How many is that in an hour?

Alfred. Let me see:—16 times 60; 960.

Mr. B. Yes; or 1920 in two hours, instead of 250; and, after all, this is but a moderate rate; some of the newspaper printing machines throw off more than double this quantity in the same time. And now I think we have done with printing for this evening.

Alfred. For this evening, papa; but not entirely, if you please. I should like to know something about type-making, and stereotyping. And then, if you will tell me about book-binding too, I shall know something about book-making from beginning to end.

Mr. B. All but book-writing, which has something to do with book-making. Well, we shall see; but now, I have my books to post; and you, I suspect, have your grammar to learn; and we must neither of us neglect our proper business in thinking or talking about that of other people.

THE TYPE-FOUNDER.

“I AM glad you have finished your writing for the evening, papa; perhaps you will have time to tell me a little about type making.”

Mr. B. The first printer probably found that wooden types, however hard, would not bear the pressure to which they were necessarily subjected without being broken or otherwise injured; and as type cutting was a part of the business that required much skill and patience, it was desirable to find a substance more durable, and better adapted to their purpose. Lead, being sufficiently soft to be cut by any instrument that had been used in the carving of the wooden letters, was naturally thought of.

Alfred. I should have thought that lead would be too soft to bear the work, and would not answer better than wood?

Mr. B. So it was found; and to improve it in this respect, a certain proportion of iron was mixed with it.

It was not long, however, before the idea of casting the types in moulds was entertained; and the improvement, from that time, was universally adopted. The credit of this improvement, is given to a servant of Guttenburg's; other improvements have been made in the material; and other metals are now employed in their composition.

Alfred. I suppose the types are cast in plaister moulds, like those you gave me for taking casts of medals.

Mr. B. No, not exactly. The mould is made of steel internally, with a wooden surface; the two sides of this mould are made to fit very exactly, and these form the four sides of the type. But the most curious part of the mould is that called the "matrix," which produces the letter. This is a small plate of copper, fixed to the bottom of the mould by means of a spring, and moveable at the pleasure of the moulder. The letter to be

formed, is stamped on this copper plate by a punch made of hardened steel.

When the matrix is prepared, the two sides of the mould put together, and the matrix fastened by its spring in its proper place, the next thing is to fill it with melted metal. I need not explain to you how this is done, as I have seen you, before now, casting melted lead into moulds made of chalk ; to say nothing of your medal moulds. There requires, however, a particular knack in type casting, which you have not found necessary in your operations. As soon as the workman has filled the mould with the melted metal, he jerks up the hand that holds it, so as to force the metal down to the bottom of the cavity before it has cooled.

Alfred. Why is this done, papa ?

Mr. B. The two sides of the mould, and the matrix at the bottom fit so nicely together, and the material of which they are made is so close in texture, that the air contained in the cavity cannot escape except at the top, and the weight of the metal poured into it is not sufficient to force out the air, unassisted by this motion.

Alfred. Can only one single type be cast at a time ?

Mr. B. I have never heard of moulds for casting type otherwise than singly : but this is done with sufficient rapidity. A skilful founder will in this way cast eight or ten in a minute.

Alfred. And are they finished when they are cast ?

Mr. B. No : you know that when you cast lead in your moulds, there is a piece to be broken, or cut off, from whatever impression you have taken.

Alfred. Oh yes ; the part that has cooled at the notch where I poured in the melted lead ?

Mr. B. Exactly—Well there is the corresponding notch, as you term it, to be broken off from the types. This is done by a boy, called a “breaking-off boy,” to whom they are passed after they are turned out of the mould. After passing through his hands they are not finished; but require polishing on each side. The man who executes this part of the business is called a “rubber.”

Alfred. And this is the way types are made? But now, papa, there is another thing I should be glad if you would tell me about—Stereotyping.

Mr. B. Well, it is the best plan, always to know what we are talking about. Suppose we first look in the dictionary for the word.

Alfred. Here it is papa. “Stereotype, the art of printing from solid plates, cast from moveable types, instead of printing from the types themselves.”

Mr. B. Very good. The word, I believe, is of Greek origin, signifying in plain English, solid type; and is, of itself, almost a sufficient description of the character of the art.

In the first place, the moveable types are set up in pages, just as though intended for printing by the usual method; each page being secured in a separate chase. It is necessary that they should be very accurately composed, as every error would be afterwards transferred to the solid type, and occasion considerable trouble in rectifying. This accuracy being properly ascertained, the pages of type are delivered over to the stereotyper;—and now commences his work.

He first places the page of type in a frame, called a “moulding frame;” rubs it over with an oily liquid; and then pours on it a mixture of plaister of Paris and water. This, when first

poured, is about the consistence of cream ; but it soon hardens—as you know by your own experiments—and forms a cake of about half an inch in thickness, covering the face of the page of type. The oil prevents it from sticking, and, being lifted off, it forms the mould for the future solid, or stereotype plate.

After these moulds are removed, they have to be baked before they can be applied to the purpose for which they are intended. They are put into an oven, and baked for several hours, until they become very hard and brown. This is a difficult process : for unless the oven be kept at a regular heat, the mould becomes warped and useless. Supposing, however, that everything has gone on right, the next operation is that of casting.

Here the stereotype-founder makes use of what he calls a “ casting-box.” This is a kind of iron pan, large enough to receive the mould, and about two inches deep. On the bottom of this pan is a cast-iron plate, called a “ float-plate ;” and on this the mould is laid, with the type part downwards. Then, there is an iron lid, that fits very closely into the pan, except at the four corners, which are cut off for the admission of the melted metal. This lid is laid down on the mould and kept firm and fixed by a screw. The pot is then dipped into a vessel of melted type metal, which, you may easily imagine, soon fills up the part left vacant between the plaister mould and the floating plate, and takes the exact impression of the lettering on the face of the mould. I should have told you, however, that the mould has a margin or ledge on all sides, which prevents the letters from touching the floating-plate, and leaves sufficient thickness for the future stereotype plate ; and notches are

cut in this ledge, to allow the metal to insinuate itself. I think now, you understand the principle, and, in some measure, the practice of stereotyping.

Alfred. Yes, papa, thank you: but is nothing more to be done before the plate can be used for printing?

Mr. B. Yes: the next thing is to break off the mould, which is now useless, and the superfluous metal; after which the back of the plate is planed by a very curious machine to bring the plate to a proper thickness; and, last of all, the face of the plate must be examined, to find out any imperfections that may have occurred in the casting. These imperfections being removed, or rectified, the plate may be handed over to the printer.

Alfred. There must be a great deal of trouble and expense in making these plates: why are they used rather than common types, papa?

Mr. B. The great advantage of stereotyping is that it saves expense, instead of adding to it. It prevents the necessity of printing more copies of any book than will meet the present demand. The sale of books is very uncertain; and, in printing with moveable types, a great deal of money is sometimes lost, or, at least, lies idle for a long time, by printing a larger number of copies than are called for. On the other hand, if too small a number are printed, the whole expense of setting up the types must be again incurred before another copy can be produced. Stereotyping meets these inconveniences, because the plates are always ready for use; and the public can be supplied with the work as fast as they require it, while the publisher is not overburdened with stock. But, perhaps, you will understand this better some years hence.

Alfred. What a number of things there are that I know nothing about !

Mr. B. I am glad to hear you acknowledge this, Alfred. It is only the ignorant and presuming, who imagine they know everything. The wisest men and the best men have made the same acknowledgment that you have just uttered ; and the wiser and better they are, the more they feel their ignorance and weakness.

Humility is the only path to true wisdom ; and in proportion as we become truly wise, so will our humility increase. It is an infinite mercy to be able to say, "One thing I know, that, whereas I was blind, now I see," John ix. 25. But then, the good man can say, "What I know not now I shall know hereafter;" or, with the apostle John, "It doth not yet appear what we shall be ; but we know that when he shall appear, we shall be like him ; for we shall see him as he is," 1 John iii. 2.

" Our knowledge of that life is small ;
The eye of faith is dim :
But 'tis enough that Christ knows all ;
And we shall be with him."

Always, my dear boy, "be clothed with humility."

Alfred. Papa, can you tell me how long stereotyping has been practised ?

Mr. B. The principle was thought of, more than a hundred years ago, by a printer, whose name was Ged, who attempted to put it into practice ; but the prejudices of the compositors of that day were too strong for him, and defeated all his endeavours.

But I think you wish to know a little about book-binding ?

Alfred. Oh yes, papa : if you please.



THE BOOKBINDER

Mr. B. Well then, let us take a book ; our old friend, the “ Middle Ages of England ;” it is handy, and will answer the purpose of my description as well as any other. The first thing done towards the binding of this book, was the folding of the sheets. You know that there are a certain number of pages in every sheet, according to the size of the book. This book, and all books of this size, have thirty-six pages to a sheet. If you were to take a sheet of this book before it is folded, you would see that the pages do not follow each other regularly and in order ; but would appear scattered about in utter confusion. But when folded, this confusion is at an end, as we see here.

The folders are principally females, who use an ivory knife to press down the folds as they are made.

The next thing done is, to collect, or gather the folded sheets into volumes. Most likely, a

certain number of each of the sheets of this book were folded, and placed in heaps together; and, if so, in making up the book, one sheet from each heap had to be taken and placed in proper order. Now, if we look at the first page, we shall see on the bottom margin, the first letter of the alphabet, A. Now look at page 37, which is the commencement of the second sheet, and you will find that marked D; and so on, to the last sheet. These letters are placed there as guides to the gatherer. In this volume there are ten sheets, which are thus put together, and are then ready for sewing.

In sewing, a kind of press is used, called a "sewing-press." It has two upright bars rising out of a flat board, and these are connected at the top by a cross-bar. From the cross-bar, a number of strings are drawn tightly down, and fastened at the bottom; and each sheet, as it is to be sewn in order, is laid on the board, with the back close to the strings. The collated book having been pressed, and an incision made with a saw, for the reception of each string (technically, bands) required, the sewer passes her threaded needle backwards and forwards, through the centre fold of each sheet, twisting the thread round each string.

Alfred. Are there not four strings here? There seem to be marks of them at the top and bottom of the book, though I cannot see the strings.

Mr. B. No; there are no strings there, but the thread is knotted in a kind of stitch, to allow it to pass from one sheet to the next without loosening. Well, now, I think we may pass on to the cover, which you see is composed of two parts; the board which gives it the proper degree of stiffness, and the cloth which hides the board from sight. But before putting the book into its cover, or case

as it is called by the binder, it passed through two or three processes. In the first place, the back was covered with a thin coat of glue to strengthen the sewing. If we open it and peep in between the back of the sheet and the back of the cover, we shall see the marks of it. The book is then trimmed at the edges, after which it is rounded while the glue is yet damp ; it is then lined with linen, and while the glue is not yet dry, it is "backed," or the grooves made for the reception of the boards. It then has a second lining of paper to strengthen the back. The book is then put into its cover.

Alfred. What is the use of rounding the back ?

Mr. B. I am not aware that there is much real utility in this peculiar form, but it has something to recommend it as far as appearance goes ; and we are not bound to despise every thing that is merely pleasing to the eye, without being of any other use. Were we to do so, we should have to reject many things which tend very much to our gratification.

Alfred. Yes, papa, I think we should ; and yet, I would rather that what is pleasant and agreeable should be useful too.

Mr. B. And so would I generally ; but where a few strokes with a hammer will produce one quality without impairing the other, I think we may very safely admit of them. But, if you please, we will go on with our binding. At the time that the back was rounded, it was placed between two boards, and squeezed tightly in a press. About a quarter of an inch of the back of the sheets was allowed to project above the edges of the boards, so as to form a sort of groove for the hinges of the cover. If you look again at the book, you will see what I mean. It helps to keep

the cover in its proper position. Without this contrivance, the stiff boards would be liable to project inconveniently beyond the back of the sheet.

The last thing done, before putting the book into its cover, was to smooth the edges. In this book only the front and bottom edges are smooth ; some books in cloth boards are not smoothed at all, and bound books are smoothed all round. To effect this, the book was again put between boards, and screwed into a press, the rough edges projecting a little above the boards ; they were then cut off with a sharp instrument called a plough.

Alfred. But the front was rounded in when the back was rounded out ; and the smooth edge is not level like that at the bottom.

Mr. B. True ; before fixing the book in the press for the purpose of smoothing the front edge, the workman gave the back of it a smart blow upon his bench, which brought it straight again for a time, and then putting it into the press, smoothed the edge. After it was taken out, it sprang back again to its former rounded position.

Alfred. Well, this is curious, if not useful. And now I suppose the book is ready for its cover ?

Mr. B. Yes ; the first thing in preparing the case, was to cut the mill-board to the proper size. This was done by a machine something like a pair of shears ; the board being slipped into a kind of frame, to ensure its being cut to the right size. The next thing was to paste the outer cover on to the board, leaving sufficient space for the back. And then it was ready for its future destination.

Alfred. How were the book and the cover fastened together ?

Mr. B. In the book we are examining, the

cover was prepared beforehand, as I have just described ; and all that remained was to flatten the ends of the strings which bind together the sheets, glue on a strip of linen to the back of the book, sufficiently wide to reach a little way on to the side boards, to which it was also glued, and then to paste down the blank leaves at either end : and so far, the binding was completed. The only thing now remaining, if indeed that was not done previously, was to letter the back, and ornament the sides with the neat scroll that you see upon them.

Alfred. Are all books bound in the same way ?

Mr. B. Not exactly. Those which are bound, or half bound, in leather, are put into the boards before the outer covering is applied. In this case, holes are made in the boards opposite the strings, and the strings are passed through these holes and fastened down with glue or paste ; after this the leather is pasted on to the boards. Then, some books have their edges marbled, or sprinkled with different colours, or gilded ; and there are many variations in the manner of binding and decorating, according to the material employed, and the expense intended to be incurred. But I think I have told you enough now, to give you some idea of the way in which the operation is performed.

And now that we have come to the end of our list—paper-making, printing, type-founding, and book-binding—let us just compare our condition, as rational creatures, with what it would have been five hundred years ago, when there was no such thing as a printed book in the world ; and, I think we shall see reason to be very thankful indeed, that our lot has been cast in the times in which we live. In those days of darkness not one in a thou-

sand, in all probability, could write, or even read, his own name ; and all the information that could be obtained, on that most important of all matters—religion—was to be sought, if sought at all, at the hands of interested and corrupted priests, who thought that their craft was endangered by the spread of knowledge among their flocks ; and who therefore, like the lawyers in our Saviour's days, took “away the key of knowledge,” and neither entered in themselves, nor suffered those to enter that were desirous of doing so, Luke xi. 52.

And then, if by any means, and in spite of the great impediments laid in the way, a small amount of information was obtained, and more thirsted for, to what dangers were the aspiring individual exposed. “Heretic” was the name, and martyrdom was the frequent end, of those who, obtaining a glimpse of Divine truth, sought to impart it to those around them.

At length came printing, and with it the Reformation ; and all attempts made by the enemies of truth to stay the progress of either, were vain. God, in his merciful providence, ordained that the one should be the help-mate of the other ; and the light of the gospel was shed abroad, where all before had been dark as the shadow of death.

Let us compare the price of a Bible before printing was discovered, with the price of a Bible now. Then, the wages of a working man were three half-pence, or two-pence a day ; and a sheep could be bought for one shilling ; but a Bible for not less than twenty or thirty pounds ! Now, I pay my gardener two shillings and sixpence a day, and he can buy a Bible for sixteen pence ! In the first case, a man must have devoted the entire labour of many years to the purchase of the inestimable bless-

ing, even supposing that he could have used it when obtained. Now, the means of instruction are placed within the reach of the poorest persons in the land ; and the labour of a few hours may put them in possession of the best and most valuable book in the world.

You remember that I did not agree with the gentleman the other day, who spoke against cheap learning and cheap books. How could I, when I knew that Sunday and other schools are teaching tens of thousands to read the words of everlasting life, who would otherwise live and die in ignorance of them ; when I considered that in forty years the Bible Society, alone, has distributed about fifteen millions of cheap Bibles and Testaments ; and that the Tract Society, every year, furnishes a still larger number of cheap tracts, in all of which the way of salvation for the lost and ruined, is plainly and fully revealed. No, Alfred ; cheap learning and cheap books may, in some cases, be attended with injurious results ; and there are some who will wrest even the Holy Scriptures “unto their own destruction ;” but I cannot doubt that they are mighty instruments, in the hand of God, for pulling down the strongholds of Satan, and in restoring man to happiness and peace.

But let us not forget one thing, my boy. We are accountable creatures, and the privileges we possess will one day witness against us, if we do not improve them aright. Remember the verse which you have been told was written on the blank leaf of a Bible :—

“ It were, indeed, in vain to boast,
How small a sum this Bible cost ;
The day of judgment will declare.
How cheap it was, or else how dear.”



THE BLACKSMITH.

ONE of the most useful men in our village, is Peter the blacksmith. If the squire's riding horse casts a shoe; take him to Peter, and he will furnish him with a new one in a few minutes. If the farmer's plough-share gets broken in turning over the stony ground; or if his wagon wheel loses a tire, or his light cart wants a new spring, Peter is the man to set all these matters right. The gardener's rake has lost a tooth; or his spade is broken short off at the handle; never mind; only take the maimed tools to Peter, and he will supply a tooth to the one, and a handle to the other. In doors it is much the same. We

want a fire-guard, or a smoke-guard—a new bar to the kitchen grate, a new leg to the best pair of snuffers, a new foot to the parlour fender, or a new rod for the bed-chamber curtains ; Peter can supply all these deficiencies. “ Oh dear, oh dear,” says George ; “ my poor crossbow is broken again ; and ’tis such an ugly break this time that I am sure the carpenter cannot mend it : what shall I do ? ” “ Never mind,” says his father, “ we must get Peter to look at it, and put an iron plate on each side of the fracture ; and it will be as strong as ever then.” Then when a stranger passes through our street, he is almost sure to notice the handsome iron railings before the doctor’s shrubbery, and the weathercock on the church steeple, and the tall cowl on the top of the kitchen chimney at the parsonage ; and if he should happen to ask who fixed this, that, or the other, the reply would be—“ Peter the blacksmith, to be sure.”

And you may see signs of his activity and usefulness whenever you pass his shop ; and you may hear them, long before you turn the sharp corner that brings it in view. Whoever is idle, Peter is not. Ding, ding, ding, goes his hammer all day long ; and the blazing fire and bright sparks are very cheerful objects on a cold winter’s day. Ah ! there goes the farmer’s team to be shod ; and here comes the carrier’s cart with a load of iron rods, rattling at every step his horses take—and two or three bags of nails ; and he stops at Peter’s shed to unload. Well, we are glad that business is so brisk ; and that Peter and his men—for he keeps two men at work—are so well employed.

What would a country village be without its blacksmith’s shop ? And the blacksmith is quite as necessary in towns and cities as he is in the

village; though, in them, he often retires more from public view. If you want to find a blacksmith in London, you would not think of looking for him in Cheapside, or St. Paul's Churchyard, or Piccadilly: but there are blacksmiths in London notwithstanding. The fact is, the material he works upon is so necessary to the convenience of life, that it would be difficult to point out every particular to which his labours extend; and it would be more difficult still to guess at what we could do without him.

We must not stop to give an account of iron-mines and ore; or of the manner of smelting and casting it; of the different uses to which it may be put, and the various qualities it possesses. There is a very interesting little book, called, "The Philosophy of Common Things,"* which contains a great deal of information on these, and many other subjects; perhaps our young friends can procure this volume; it is well worth their study. All that need be said here, is, that iron is brought to the blacksmith in the form of bars, or rods, and sheets; and is called bar-iron, or sheet-iron, from this circumstance.

Now let us take a peep into the blacksmith's shop, and look at his tools, and see how he handles them. There he is, still at work; his jacket thrown aside, and his shirt sleeves tucked up above the elbows: he has no need of superfluous clothing. He wears a paper cap, however, to keep his hair free from the dust and smoke to which he is exposed. See, he has just taken a short bar of iron from the fire; it is red hot, and he holds one end of it between the tongs in his left hand, and lays

* Published by the Religious Tract Society.

the red hot part upon the anvil. Now he snatches up the heavy hammer, and begins to clang away upon it hard and fast. There are sparks ! It is a real firework. But stand back, or they may form too close an acquaintance with you. Now the iron becomes duller and the sparks are less vivid ; it must go again into the fire : but he has not been hammering away for nothing. The bar is flattened at the end, and has been bent half round with two or three strokes of the hammer. We can easily imagine that a horseshoe will soon be the result of his labours. Now the iron is in the fire again, and his tongs are thrown into the trough of water, in front of the fire. “Hiss,” says the water, and “bubble” comes up the hot air from the bottom of the trough. And now for the fire. It is not just to Peter’s mind, so he beats it up a little with an iron rod with one hand, while the other is employed in blowing the bellows that are to be seen behind the forge. Half a dozen puffs, and the fire brightens up so that we can hardly bear to look at it ; and out comes the iron again, sparkling with fiery heat. Now for the tongs again, and then for the hammer ; and now for the beautiful sparks and the musical ding, ding, of the anvil :—there, the other end of the bar is flattened and bent, and the ends are turned up, and so is the curve in the middle ; and all that is wanting are the holes for the nails which are to fasten it to the horse’s foot. Once more to the fire, and back again to the anvil, and it will soon be finished. But now another tool is necessary, and Peter requires his man to hold the shoe upon the anvil while he makes the holes with a punch. There is a hole in the anvil, over which the part of the shoe is placed that is to be punched, and two or three blows of

the hammer completes each hole. Now it is done ; and before it has time to cool, plunge goes the shoe into the water trough. Hiss—hiss, and bubble—bubble, repeat the water and the air ; and up comes the steam, while Peter takes another iron bar and thrusts it into the fire to prepare it for his anvil and hammer.

And now we may look at the tools he uses. First, lift the hammer which he seemed to handle so lightly. Ha ! it is heavier than you thought. Your puny arms would soon tire with the weight. But look at the difference between his arms and yours. He has wielded these hammers, till his muscular power has been increased so that we may fancy he could almost knock down a horse with one blow of his fist ; and his hand is like one of his own iron vices for strength and firmness of grasp. You would not like to be held within his clutch. But, never fear ; though he is strong, he is good natured and gentle. Peter would not hurt a fly if he could help it.

But he has hammers of different sizes. Some of them are as small as those which a carpenter generally uses ; and others are much larger than the one you have just seen him employ ; and so heavy, that they require both of his powerful arms to wield them effectually. You may look at the anvil upon which he hammers his red hot iron. The body of it is made of forged iron ; and the top of it, of steel, so hard, that the sharpest file can make no impression upon it. It has a hole in it, one use of which you have just witnessed ; and another is, to form a socket for a sharp iron chisel, upon which a bar of red hot iron may be laid, and cut in two with a stroke or two of the hammer.

Then, at his bench, he has vices of different

sizes—files, rasps, iron chisels, punches, and pincers ; and handy by the forge, he keeps his tongs and large pincers, ready for use as he requires them.

But we must not forget his bellows. They are like a pair of common kitchen bellows ; but a very great deal larger. You see they are behind the forge, which is built up to the roof of the shop, and terminates in the chimney at the top. There is a hole in the back of the forge which communicates with the fire ; and the nozzle of the bellows is fixed in this hole. The bottom board of the bellows is fixed on a kind of stand, and the top board is moved up and down by a wooden handle, on one side of the forge.

Look at these shears, too, with one blade fixed in a heavy block of wood. With these shears the blacksmith can cut a sheet of iron, with as much ease as you could clip off a strip of pasteboard with a common pair of scissors.

Well, we have seen Peter make a horse-shoe, we will now watch him while performing another operation. He is about to join two iron-bars together so as to make them one. This job requires more cautious management than the former ; for a particular degree of heat is required in the iron to be joined, and if this is either exceeded or not attained, all the labour would be thrown away. A blacksmith can tell, by practice, just when the proper time has arrived to take the irons out of the fire, though, perhaps, he could hardly explain the signs which he himself understands. It is an interesting process however. See, the bars are now ready, and Peter takes one, and his man the other. Now, they lay the heated ends together on the anvil, and each with his hammer, beats away

merrily, turning round and round the ends of the bar which they hold in their left hands, until the work is completed. Now they have quenched it in the water, and you may examine the joint;—but there is no joint to be seen, the bar is as completely one piece of iron now, as though it had never been two. This is called “welding;” and the necessary heat required, is called a “welding heat.”

We must now leave Peter and his men, and the forge and tools. There are horses waiting to be shod; and we have seen this operation performed so often, as to render us indifferent to the sight. We will get away from the heat and dust, and breathe the cool air again.





THE ROPE-MAKER.

WHAT is a rope made of? Perhaps there are a great many young folks who have seen and handled ropes very often, and who have still oftener tied up a parcel, or flown a kite with a piece of twine, who could not answer this question.

In some parts of the world, people make ropes of the bark of trees, of the outer rind of rushes, and the large and long leaves of a kind of grass; and in other parts, the entrails of animals and fishes are made into a kind of string or twine; and both string and rope can be made of the tough twigs of some sorts of trees. Stinging-nettles can be made into strong string, and so can brambles; but none of these things furnish us with the string and cord for which we find almost daily use.

There are two plants to which we are indebted for very many conveniences—flax and hemp.

Flax is cultivated in large quantities in Scotland

and Ireland, and some parts of England, and is made use of for several purposes. The seeds furnish a valuable oil, and after the oil is extracted, what is left of the seed is sold for fattening cattle. It is very likely that the young reader has often heard of linseed oil and linseed cake, without knowing that they were produced from the same source that furnishes the material for his linen shirt, and drill trousers ; and, perhaps, is hardly aware that he is indebted, for these comfortable articles of clothing, to a humble plant, which is sown in the spring, flowers in the summer, and is cut down in the autumn.

It is the stalk of this plant which is converted into thread, and from thread into innumerable articles of luxury and comfort, from the exquisite lace that ornaments the dress of our Queen, to the coarse and homely dowlas that helps to clothe the poor hard-working cottager.

The finer kinds of twine are also made of flax.

Hemp is the principal material used by the rope maker. It is a larger plant than flax ; and the fibres of the stalk are coarser and tougher. Very large quantities of hemp are grown in Russia ; and from that country, nearly all that is used in the manufactures of England is imported. Of this, a large share goes to the rope-maker ; and we have now to see how he turns it to account.

When the hemp comes into this country, it is in large bundles, which have to be separated, and tied up in smaller lots called " heads," before the rope-maker begins to work upon it.

The first process through which the material passes, after it comes into the hands of the rope-maker, is that of " heckling." The heckle is a kind of comb, having a great many rows of sharp

steel spikes, or teeth, through which the hemp is drawn, in order to free it from dirt and dust, and to draw out the fibres straight and smooth, and parallel with each other. Thus prepared, it is ready for the rope-walk.

A rope-walk is a narrow space of ground, several hundred feet in length ; and here the operations of the rope-maker are principally carried on. Some of these walks are covered with a tiled roof to protect the workmen from the weather, but frequently they are quite exposed.

At one end of the rope-walk is a large wheel, so contrived, that when it is turned, it gives a kind of whirling motion to a number of small hooks that are placed in a frame above it. These hooks are used in the following manner :

A man, having a bundle of hemp twisted round his waist, fastens a few of the fibres on one of the hooks, which is immediately put in motion by a man at the wheel. Then, the man who has the hemp, takes hold of the fibres that he has fastened to the hook, with a piece of woollen cloth, which he holds in his right hand, and begins to walk backwards. The turning round and round of the hook twists these fibres, and as fast as they are twisted, the man supplies more hemp from the bundle that is round his waist ; and as he continues to walk steadily backwards until he reaches the end of the walk, he has presently made a long piece of string, one end of which is fastened to the hook at the spinning-wheel, and the other is still fastened to his body by the hemp that remains. This string is called a " yarn." To prevent this yarn from trailing on the ground as it increases in length, there are several poles, or beams, fixed overhead, at different parts of the walk, into which

hooks are driven ; and, as the spinner arrives at these beams, he throws the yarn on to the hooks.

As soon as he reaches the end of the walk, the yarn is taken off the hook at the wheel, and fastened to a reel upon which it is to be wound ; and as the reel is turned, the man walks up towards it, till the yarn is all wound off, when he is ready to repeat his operations.

Now if our young friends will take a piece of string, and untwist it, they will find that it is composed of two or three parts wound tightly round each other. Well, each of these parts is a yarn, and is made in the way just described. If a piece of common packing cord be examined, it will also be found to consist of a great number of these yarns twisted together. But in larger ropes, such as those which are used in the rigging of ships, or for any other purpose requiring strength and durability, three of these cords are twisted round each other, and they are then called “strands.” And in cables, which are the large ropes to which the anchors of ships are fastened, there are three of these twisted together, and in this state they are called “shrouds,” or “shroud ropes.” So that in every cable, or rope made in the same manner as a cable, there are three shroud ropes ; in each shroud rope three strands ; and in each strand a number of yarns, varying according to the size of the strand. Very likely our young friends may be reminded, by this description, of the scriptural proverb—“A threefold cord is not quickly broken,” Eccl. iv. 12. And if they learn by it to exercise those kindly feelings towards all with whom they are connected, which will exemplify the moral bearing of the proverb, the description will not have been written in vain.

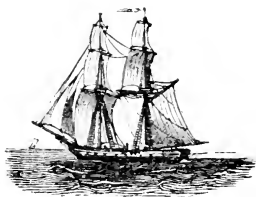
When ropes are exposed to damp or wet, they soon rot and become useless ; and it is necessary to adopt some means to prevent this. This is why tarred ropes are used in the rigging of vessels. It is found that the tar covers over the fibres of hemp, and thus prevents the water from penetrating them.

Ropes are always tarred in the yarns ; before they are twisted into strands. In passing through this operation, the yarn is wound off the reel and made up into a long skein or "haul," as it is called, and is then dipped into a vessel of hot tar, and is afterwards drawn through an aperture sufficiently small to force out the superfluous tar, and at the same time, to press what remains into every part of the yarn, so that all the fibres of hemp may be equally covered with it.

Rope-making is a very useful employment ; for what could be done without rope and cord and twine ? How could we fly a kite or spin a peg-top without string ? And how could the tradesman tie up his parcels without it ? What could the farmer do without cart ropes or the builder without scaffolding ropes ? And, above all, how could the sailor manage without the cordage of his vessel, or the strong cable upon which his safety, and even life, so often depends.

There are several references made to ropes and cords in the Bible, and there is no doubt that ropes, made of flax, or hemp, or some other strong vegetable substance, are meant. You remember the when the Philistines endeavoured to find out that secret of Samson's great strength, they bound him with new ropes, thinking thus to secure him ; but he broke them from his arms like a thread, Judges xvi. 12. In another place, the pains, and

expense, and labour, which wicked men take to gratify their sinful inclinations, and to overthrow the power of the Almighty, are spoken of as “drawing iniquity with cords of vanity, and sin, as it were, with a cart rope,” Isa. v. 18; and a dreadful woe is threatened against them. And who can sin against God, and prosper? There are sometimes people to be seen now, who toil painfully in the service of Satan; who spend their money, and their strength, and their lives in “drawing sin as with a cart rope.” Let us pity them and pray for them.



THE TALLOW-CHANDLER.

IF we had no means of obtaining light, except that natural light of the sun with which we are so mercifully provided, a great deal of our time would be spent in idleness, that may now be usefully employed. It is a kind and merciful arrangement of Divine Providence which withdraws the sun from us, at regular intervals, so that we may enjoy our necessary repose undisturbed; and we have equal reason to bless our gracious Creator for the night and for the day, for light and for darkness. But we do not need the whole time of the sun's absence for sleep; and there are, besides, seasons of sickness and watching, alarm and danger, in which our comfort and usefulness depend upon our means of supplying the want of the natural light of day; and with such means we are amply provided. Perhaps there is no part of the world in which the inhabitants—however ignorant they may be—are not acquainted with some method of procuring and sustaining artificial light, without having recourse to large fires, when not needed.

We frequently read in the Bible of candles and candlesticks; but we are not to understand that the same kind of candles and candlesticks are meant, which we commonly make use of. In hot climates—and it was in a much hotter country than ours, in which the transactions that we read of in the Bible took place, and in which it was written—the substance of which our common candles are made would not harden; and though they had plenty of wax, we do not know that they made any use of it for this purpose. The candle-

sticks that we read of, were lamps for burning oil ; and the candles were the wicks and oil which were burned. In the same countries now, oil is generally used, when a light is required, as it is also very frequently with us.

Candles are made of various materials. We have wax candles, and spermaceti candles, candles made from a part of the cocoa-nut, and tallow candles. The three former kinds are made by the wax-chandler ; and the latter by the tallow-chandler. Our business now, is with him only.

We all know that a tallow candle is composed of two parts ; the wick, and the tallow with which it is surrounded. Let us first look at the wick. But there are two kinds of wick ; one is made of rushes, and the other of cotton. The former are made of the common rush, which grows so abundantly on damp marshy ground. These are cut at the proper season, and peeled and dried by women and children, who thus earn a little money when they might otherwise be idle. And we ought to be obliged to them ; for who has not experienced the comfort of a rush-light, through long nights of sickness and watching.

Cotton wicks are made of cotton yarn, which the tallow-chandler buys in large balls. Each yarn is about as thick as a large thread ; and in preparing the wick, the workman takes the ends of a certain number of them, and drawing them through his hand, so as to form a loose kind of string of the whole, cuts them to the proper length. He is assisted in this operation by a board laid across his knees, at one end of which is fixed a round wooden peg, and at the other, a sharp blade. In using this board, the cottons are drawn round the peg to the blade ; thus forming a string of double the

first size, which is left looped by the middle on the peg. When the peg is full, the cottons are taken off on to a smooth stick. After the wicks are cut, they are dressed or "pulled;" that is, they are combed out smooth and even, with the fingers, and all knots and loose threads removed. Then they are spread at a little distance apart upon the sticks, and are ready for dipping.

We come now to the tallow, without which the wicks would give but little light. Tallow is the fat of animals, boiled away from all the membranes, or fibres, with which it naturally abounds. A great deal of the tallow used in this country is brought from Russia, and is sold to the candle-makers by the merchants who import it; but the business of a tallow-chandler includes tallow-making, as well as candle-making.

If you were to go into a tallow-chandler's warehouses, you would, in all probability, see that one of them contained a large quantity of anything but nice looking fat, such as you might suppose to be the refuse of the butcher's shop, or the scraping of the slaughter-house; and if it should be in hot weather, and you should, in addition to this, be somewhat particular, as far as your sense of smelling is concerned, the further probability is that you would wish to leave such a disagreeable store-room as soon as possible. The tallow-chandler, however, is not quite so particular as you are; custom has made him indifferent to what you might think offensive.

In order to turn this fat into tallow, it is chopped into small pieces, and afterwards boiled in a copper, until it is completely separated from the membranous parts. It is then strained off, and left to cool; and what remains after straining is pressed

into large cakes, which are sold as dog's meat under the name of "greaves." This process of fat-boiling is called "rendering."

And now for the way in which the wicks and tallow are united so as to form a candle. But there are two sorts of tallow candles; one is called "a dip," the other "a mould." These names are given them from the way in which they are severally made. We will first watch the chandler while he makes his dips; and must, therefore, suppose ourselves to be in his candle-shop for a short time.

The first thing we have to notice is, a large copper, fixed in one corner of the factory; this, we may take for granted, is the same copper in which the fat has previously been converted into tallow. Now, however, it is full of melted tallow, kept in that state by the copper fire.

The next thing we notice is a sort of oblong trough, or vat, at a little distance from the copper, filled also with melted tallow. This trough stands about breast high: underneath it we may see a small charcoal fire, which is now burning brightly. It will be understood that this fire serves the same purpose to the tallow in the trough as does the other fire to that in the copper.

Looking around us we shall see that there are ranges of wooden arms stretching out from the walls of the building, and that on each pair of arms are lodged a number of sticks strung with candles, which may perhaps be half made. And we notice, further, that there are windows on every side of the building, and that they are now all open. We may judge from this that plenty of air is necessary where candle-making is going on. In one part of the building, or perhaps in a cellar underneath, we may probably observe several large casks full

of hard tallow, from which a supply is kept up for the copper.

We have now finished our survey, except that, suspended from the ceiling is a sort of scale-beam, having at one end a scale containing weights, and at the other a framework of iron, which hangs just over the trough of melted tallow. We shall soon see its use.

While we have been glancing around, the candle-maker has not been idle. We have seen him regulating his fires, stirring the tallow in the copper, and filling up the trough with it ; and now he is dipping the partly made candles into the trough. Had we been present at the commencement of the making we should have observed that he performed this by hand ; but now he makes use of the frame that we have noticed. We see that several of the sticks from which the wicks are hanging are fastened together by a cross piece of wood at each end, in which are holes at a regular distance apart to receive them, thus making a kind of frame.

He now takes one of these parties of sticks, and places them on the frame above the trough, gently pushing the wicks down into the melted tallow, and suffering them to be steadily drawn out again by the weight at the opposite end of the beam. Then, after allowing them to drip for a short time over the trough, he replaces them upon the arms, or rack, and proceeds in a similar manner until the whole making has been dipped. This is repeated again and again, each dipping increasing the size and weight of the candles, until they sufficiently attain to both, which is shown by the weight in the scale. We have before been aware that there is a great difference in the sizes of

candles; and have perhaps been learned enough to know that some are called sixes, some eights, and some tens; and we may have guessed that these distinctive names referred to the number of each contained in a pound: we can, therefore, easily understand now how all this can be regulated and ascertained by placing more or less weight in the scale.

Mould candles are made in a different way: they are, as the name implies, cast in a mould. These moulds are made of pewter. They are a little larger at one end than at the other, to allow of the candles being more easily drawn out; and twelve or more of them are fixed in a wooden frame. At the top of this frame is a trough which communicates with the larger end of all the moulds. The wicks are drawn through the moulds, and kept firmly in the centre by strong wires. The melted tallow is then poured into the trough, and from the trough it runs into the moulds, and there cools and hardens. After this, the wires are removed, the trough cleared of the superfluous tallow, and the candles drawn out of the mould.

We do not know when candles—tallow candles—were first invented; but it is probable that the art of candle-making has been practised, even in our own country, for many hundreds of years. It is said that king Alfred contrived to measure time by the aid of candles. There were no clocks and watches in those days, and though some kind of sun-dials might have been known to him, they would be of no use in the night, and when the sun was hidden behind the clouds. He, therefore, contrived wax candles that burned out in four hours, and marked the smaller portions of time by notches cut in the candles. This was an ingenious

contrivance, and was not practised merely for the sake of doing a clever thing. Alfred made good use of his time, and the division of it was, therefore, really serviceable to him. This story proves that wax candles, at any rate, were used then; and the probability is, that animal fat was applied to the same purpose; but of this we cannot be sure, nor is it of much consequence for us to know.

But why does a candle burn? What produces the flame, and how is it sustained? Should our young friends be inclined to put these questions, they are referred to the little book we have already mentioned, where they will find them fully answered.*

Before we leave this trade we may just mention a few references made in the Bible to candles, or lamps. The guidance and blessing of God is compared by the patriarch Job, to the light of a candle. He was lamenting his sad and desolate condition; and said, "Oh that I were as in months past, as in the days when God preserved me; when his candle shined upon my head, and when, by his light, I walked through darkness," Job xxix. 2, 3. And unless we have the blessing of God we are in a dark and dreary condition; and without his guidance, we are sure to go wrong, like a person who stumbles in the dark. But though Job was in distress, he was not forsaken: the candle was not put out, though it was for a little time hidden from him. We "have heard of the patience of Job, and have seen the end of the Lord; that the Lord is very pitiful, and of tender mercy," James v. 11. He never really forsakes those who love him.

* "The Philosophy of Common Things."

It is very different with the wicked: "How oft is the candle of the wicked put out? and how oft cometh their destruction upon them?" Job xxi. 17. Their candle is made up of mere earthly comfort; their light perishes when an angry God breathes upon it.

The word of God is spoken of as a lamp. "Thy word is a lamp unto my feet, and a light unto my paths," Psa. cxix. 105. Men do not "light a candle, and put it under a bushel, but on a candlestick," Matt. v. 15. This was the language of Jesus to his disciples; and he explained his meaning, by saying, "Let your light so shine before men, that they may see your good works, and glorify your Father which is in heaven," Matt. v. 16. We see, then, that religion is not a selfish thing; and if we possess it, it is intended that others should be benefited by it, as well as ourselves. Let our first question be, "Have I this light in my own soul?" and our next, "How can I spread it abroad in the world?"

Heaven is a glorious and a happy place. "They need no candle" there, Rev. xxii. 5. Here, the word of God, and the preached gospel, are necessary to give light and comfort; but there, "the Lord God giveth them light," Rev. xxii. 5.

'T is gloom and darkness here;
'T is light and joy above;
There, all is pure, and all is clear;
There, all is peace and love."



THE BASKET-MAKER.

BASKET-MAKING was certainly one of the earliest arts in our country; for, when our ancestors were known as little better than a nation of savages, their fame as basket-makers had spread to Rome: and they not only made baskets for domestic purposes, but turned their skill to account in the manufacture of shields and boats of wicker-work. The boats were called coracles. They were covered with hides to keep out the water, and were used for fishing and crossing rivers. They had the advantage of lightness; and, therefore, could easily be conveyed from place to place on the backs of their owners.

The inhabitants of many almost uncivilized countries in the present day, excel in this useful art. The natives of the islands in the South Sea make baskets of leaves and rushes; and, in some parts of the world, the huts of the inhabitants are merely a rough kind of basket-work.

Baskets are made of various materials; but the most common with us, is the osier, or willow, which grows plentifully in the neighbourhood of rivers, and other moist places.

There are large plantations of willows, or osier beds, as they are called, on the banks of the Thames, and other rivers in this country; and great attention is paid to their cultivation and management. To produce good osiers for basket-making, the soil requires to be drained and manured, with as much care, as for crops of corn.

Osiers are fit to cut about once in three years. When cut they are tied up in bundles and set on end in water, where they are allowed to remain till the shoots begin to sprout in spring, when they are fit for use.

The first process which they undergo is, that of peeling. The instrument used for this purpose, is called a "brake," or "brakes," and consists of two iron blades welded together at one end, and sharpened, so as to be fixed into the ground, while the osier is drawn between the upper part of the blades, which are pressed together by the left hand of the peeler. Sometimes a cleft stick is made to answer the same purpose.

After the osier rods are peeled, they are again tied up in bundles, to be sold to the basket-makers as they may be required.

In some kinds of basket-work, the osiers are used whole; but in others, each rod is divided into

“splits,” and for still finer work into “skeins.” They are called splits when divided into two or four parts. In dividing into two parts, a common knife is used; but when four splits are required, an instrument is used, having two blades crossing each other. Skeins are thin strips of the osier rod, made by passing the splits through a kind of plane, which can be regulated so as to produce any degree of thickness in the skein that is required.

Basket-making is a kind of weaving in wood. If we take a basket and look at it, we shall find that it is composed of a number of osier rods, or splits, or skeins—according as the basket is large or small—crossing each other at right angles; the larger and stronger ones forming what may be called the warp; and the slighter ones, the woof.

In making a common basket, the basket-maker commences by laying two or three osier rods on the floor in the same direction, and touching each other. He then crosses them at right angles, with an equal number, laid close together too. Then he puts his foot on the part where all the rods meet, and weaves smaller rods round them; spreading out the first rods from time to time as he proceeds, so that by the time the bottom is finished, they stand out singly at an equal distance apart. The ends are then cut off, and other rods are thrust in by the side of each, and turned up to form the ribs of the basket. The weaving is carried up to the height required, and then the ends of the ribs are brought down and woven into a rim.

This is one way in which baskets are made, and it is perhaps the easiest to be understood by a written description; but there are a great many other plans, which vary according to the fancy of

the basket-maker, or the work upon which he is engaged. But whatever varieties there may be in the practice, the principle of weaving is carried out in them all.

We have often admired the beautiful little baskets that are made by the blind. It is one of the great glories of our land that there are so many benevolent institutions for the destitute and bereaved. This is not the case in countries where the gospel is not known. It is this that teaches men to have compassion on their fellow men, and to give sympathy and assistance where it is needed. We read of no asylums for the blind, and the deaf and dumb, in heathen countries; no institutions for the relief of the widow and the fatherless; no societies for the sick and afflicted. And for this reason, young reader, you may well say,—

“ I thank the goodness and the grace
Which on my birth have smiled,
And made me, in these Christian days,
A happy English child.”

There are many asylums for the blind in our country, and among other useful things, which they are taught while there, is the art of basket-making. It is surprising to see how dexterous they soon become in the use of their fingers, and how neatly they perform their work. It is a very merciful arrangement of Divine Providence, that the loss of one sense is generally made up by the peculiar aptitude of another. Thus, the sense of feeling is generally very strong with the blind, and they are enabled to do many things which we should think to be almost impossible to them.

We said something about the skill of our ancestors in basket-work; but there was one way in which it was exercised, that was very shocking,

and which gives us ample reason to be glad that we live in the times of the gospel. You know that the old Britons were idolaters: they were cruel idolaters. They worshipped gods that could not save them; and, when any great calamity befel their country, they regarded it as an expression of the anger of their gods; and these were the means they took to appease them. They made a very large figure of basket-work in the form of a man, and enclosed in it a great number of men—as many as it could hold—and then surrounded it with straw and wood, to which they set fire, Thus they offered up a terrible sacrifice, in the hope of having their sins forgiven. Poor deluded Britons! they knew nothing of that one sacrifice which Christ once offered up on Calvary; but we do: and let us remember that “unto whomsoever much is given, of him shall be much required.”





THE WATCH-MAKER.

THERE is an old story of a Highlander who found a watch in a field ; and having never seen or heard of such a piece of mechanism, cautiously stooped down to examine it. But as he was about to lift it from the ground, the sound of the ticking reached his ears, and startled him to such a degree, that he immediately attacked it with a stick, supposing it to be some dangerous beast. We can scarcely give credit to this story ; for though the Highlander might have been ignorant of the nature and construction of a watch, he yet would have had too much sense to mistake the glitter of metal for the skin of any animal, unless, indeed, the case were of

leather. But, let this story be true or false, watches are too common and well known to be exposed to such a risk of destruction in the present day.

The most ancient mode of measuring time, was by the shadows cast by the sun. We have instances of this in the Bible. One of these occurs in the book of Job (chap. vii. 2), where a servant is spoken of as “earnestly” desiring “the shadow.” A writer on eastern customs has explained these words by saying, “The people of the East measure time by the length of their shadow. Hence, if you ask a man what o’clock it is, he immediately goes in the sun, stands erect, then looks where his shadow terminates; he then measures the length with his feet, and tells you nearly the time.” The next step to this very natural way of computing time, was the invention of sun-dials. It was on the dial of Ahaz that the shadow returned backwards ten degrees, as a sign that the Lord would heal king Hezekiah of his dangerous sickness, 2 Kings xx. 8—11. Perhaps the hour-glass was the next contrivance adopted, and after that, water-clocks. The manner in which king Alfred divided the hours of the day, proves that the two latter instruments were unknown in England in his days. Clocks were invented, as far as we have any means of knowing, about six hundred years ago; and, then, followed the art of watch-making; but it has been only within the last two centuries that the watch-maker has held a place of any importance among English trades.

But when we speak of a watch-maker, we are not to be understood that one person manufactures every part of a watch, as well as puts it together. This is very far from being the case.

Perhaps there is no piece of mechanism—certainly there is none comprised within so limited a compass—upon which so many hands are employed to bring it to perfection. By a watch-maker, therefore, we mean a tradesman who understands the use and situation of every part of the machine, and the connection which one part has with another, and whose business it is to put them together when they are made to his hand.

Perhaps there are few young people who have not often looked at the inside of a watch, and admired the regular motion of its different parts; but, it may be, that there are still fewer who have a just idea of the number of pieces that are brought together in it, or of workmen who have helped to make it.

“Mr. Dent, in his illustrations of a lecture on the Construction of Watches and Chronometers, lately given by him at the Royal Institution, laid before the meeting the dissection of a detached lever watch. Every part was separated and displayed; but grouped in one of six larger divisions to which it belonged.

“Each part had been previously examined, and its distinct constituent pieces counted by the lecturer; the surprising result of this enumeration was, that the number of pieces was nine hundred and sixty-three, and the artificers employed forty-two. When to these are added the amount of previous operations which the materials constituting each piece must undergo before it comes into the hands of the watch artificer, a glimpse may be obtained of the extensive and numerous changes of form and value which “raw material” receives in its progress from the mine, to so refined a manufacture as a finished watch.”

Who would have imagined that there are nearly a thousand separate pieces in a single watch, or that forty-two distinct branches of trade are employed in producing it! But even this number of trades does not, perhaps, convey a correct idea of the number of persons engaged in the manufacture, as they are still subdivided into distinct departments; so it has been stated that “an ordinary gold or silver watch passes through considerably more than one hundred hands,”* before it is finished.

With regard to the watch-maker himself, the work of putting together the multitude of pieces that have been mentioned, does not entirely fall into his hands; the several pieces of which each part is composed being already combined before they reach him. He has, however, enough to do to render his trade a very interesting and skilful one. He ought to be a good judge of the quality and workmanship of the materials with which he is furnished; he should be acquainted with the principles of mechanism, and with the improvements which from time to time are introduced into his business; and, more than this, he will exercise his own ingenuity in making fresh improvements, wherever he thinks they are needed.

Our young friends will not expect here, to be initiated into the mysteries connected with the different parts of the works of a watch. They could not be explained without several diagrams or drawings; and perhaps not very clearly or interestingly with them. The actual sight of a watch, together with five or ten minutes conversation with a kind and intelligent watch-maker,

* Knight's “London.”

would do more than all that could be written about the matter. We will just say, however, that the main-spring of a watch is that which sets the whole machine in motion; and that, let the works be ever so good, unless the watch have a main-spring, it will be of no use. We may add, too, that the main-spring of a watch is never seen in the watch; it is always out of sight there. But its existence and excellence is known and seen when the movements of the watch are regular and true, and when the hands always point to the right time.

Now, religion in the heart is like the main-spring in a watch. It is this that gives life and energy to the soul. Without religion, we are dead while we live, 1 Tim. v. 6; "dead in trespasses and sins," Eph. ii. 1. We are the workmanship of God; for He formed us body and soul; and therefore our powers are fitted for his service and glory: but without religion, these powers can never perform their proper part; they want the main-spring.

Again:—Religion is a secret thing. Its seat is in the heart, and it cannot be seen by the eye. But its effects can; and by our actions we discover whether we possess it or not. If we have this main-spring of the soul, our daily and hourly actions ought to show it, just as the hands of a watch prove the existence of its spring.

Again:—If the hands of a watch be removed, though the main-spring may be good, and the works in perfect order, the watch will be useless. And religion, with us, ought to be visibly useful. It ought, not only to work within, leading us to holy thoughts and desires, but it ought to work without, and induce us to perform benevolent and

holy actions. "Pure religion and undefiled before God and the Father is this; to visit the fatherless and widows in their affliction, and to keep himself unspotted from the world," James i. 27.

May we venture to make one more remark:—A watch must be wound up every day, or the main-spring and the works alike stop in their operations. Prayer, to the Christian, is what the key is to the watch. If we have religion in the heart, and would exhibit it in the life, we must pray—pray constantly for Divine support and assistance, for Divine grace and guidance. We must "pray without ceasing," 1 Thess. v. 17.

" So let our lips and lives express
The holy gospel we profess;
So let our works and virtues shine,
To prove the doctrine all divine.

Thus shall we best proclaim abroad
The honours of our Saviour God;
When the salvation reigns within,
And grace subdues the power of sin."

CONCLUSION.

And now for a few parting words to the young readers who have thus far accompanied us; and we will then say, farewell.

You have read about a few of the trades that frequently come under your notice, and to which you are so much indebted for the conveniences, and even the necessary comforts, of life. You have perhaps learned something that was new to you, and now see additional reason why you should respect and esteem a large proportion of your countrymen, who labour for your benefit.

Should life and health be continued to you, a few years will make a great change in your engagements ; school-days and holidays will no longer alternate as they do now, and make up the sum of your existence. You will very shortly be engaged in the serious transactions of life. You will not be gardeners, builders, or any other of the trades here mentioned—possibly not. Perhaps you will not be placed to any business—as that word is generally understood—you may or you may not. But whether your future lot in life be that of a tradesman, a merchant, a farmer, a professional man, or what is commonly called a gentleman, you will have duties devolving upon you ; and upon the manner in which you discharge these duties, will depend both your usefulness and your happiness. An idle person is miserable in himself and injurious to others, whether he be dependent upon daily labour for his bread, or whether he have tens of thousands of gold and silver at his command.

You will have duties for this world, and duties for the next ; and to be happy in either you must be industrious for both. Take then, as a piece of farewell advice from one who is anxious to prove himself your friend, this text of Scripture ; Be “ not slothful in business ; fervent in spirit ; serving the Lord,” Rom. xii. 11.



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